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Products finishing

Cincinnati, Ohio Vol. 2, No. 7

April, 1938

Plating for Wear Resistance at Lincoln Park Tool and Gage Company

A Brief Outline of Plating Operations Employed for the Purpose of Hard Chromium Plating

By George Eglinton

General Manager, Lincoln Park Tool and Gage Company

THE difference between chromium plating for wear resistance and chromium plating for appearance is not always clearly defined. Where parts are chromium plated for appearance, the plate is usually very thin and is applied over previous plating such as copper and nickel. The chromium plating in this case does not afford a great amount of pro-

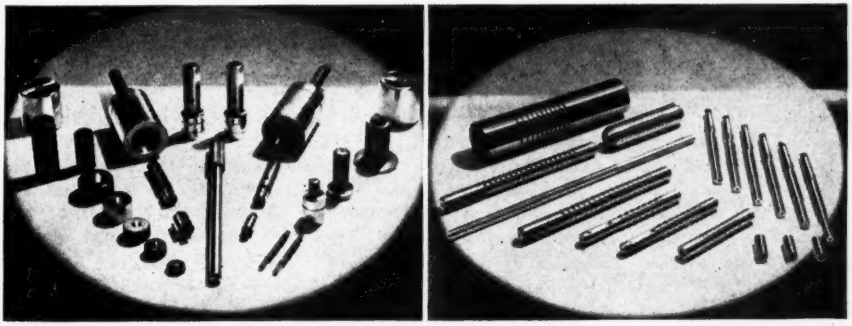

Fig. 1—Illustration showing the wide variety of plug ring and master gages that it is possible to hard chromium plate.

tection for the base metal and consequently, the copper and nickel must be applied for this purpose.

Chromium plating for wear resistance, on the other hand, is primarily applied to tools and gages where the plating is applied solely to add to the useful life of a tool or gage or to restore it to its original accuracy.

Fig. 2—Illustration showing the Pangborn sand blast unit in which each workpiece is carefully sand blasted prior to chromium plating. Openings are provided on each side of the unit to accommodate long workpieces.

Whereas the thickness of decorative chromium plate varies little between a few ten thousandths of an inch in thickness, and is usually plated over nickel and copper, the chromium plate for wear resistance is applied directly on the base metal and is deposited as heavy as five and ten one thousandths of an inch. A deposit of chromium to this thickness will permit grinding and lapping. There also exists a difference in the composition of the plating bath for decorative plating and wear resistance plating.

Experiments have shown that tools and gages plated with hard chromium will withstand abuse and wear for exceptional lengths of time in service. The Lincoln Park Tool and Gage Co., Lincoln Park, Michigan, has recently installed equipment of the latest design for the chromium plating of tools and gages. The tools and gages that have been provided with a plated surface with the equipment and methods used at this plant are readily finished to a high degree of smoothness by grinding and lapping. It has been found that any degree of accuracy that can be produced in steel can be produced with the chromium plate.

The process of plating very often tends to lessen the labor required to produce accuracy required on some types of tools. An example of this condition was found in the manufacture of test bars such as are used to test the alignment of crank shaft bearings in automobile engines. It was found that these test bars were more difficult to produce of solid steel than when plated. To be of the greatest usefulness in service, these bars must have a wear resistant surface. When it was attempted to obtain the necessary wear resistance by heat treatment alone, the bars were usually either very difficult to grind, or were distorted after grinding by the stresses left in them by heat treatment. The chromium plating of such a tool when new permits the selection of steels and heat treatment best suited for inertness and a wear resistant surface can be provided by chromium plating. In this manner, the bars are then somewhat easier to grind than when unplated as they do not possess the tendency to warp and twist during grinding.

It is common practice among many users of gages and high precision non-

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cutting tools which are subjected to wear, to salvage them by chromium plating and refinishing them when worn. The procedure that is employed at the Lincoln Park plant is to first grind the tools 0.005 in. undersize, or oversize when a hole is to be plated. An excess of chromium plate is then deposited on the surface that is to be restored, and the part is reworked just as though it were new and had just been heat treated. New parts of intricate shape that are subjected to wear are thus salvaged by plating at a small fraction of their original cost. However, this does not hold true on parts of simple design such as a plug or ring gage which require high accuracy, because in this case most of the cost of the part is represented by its final grinding and lapping.

The practice of salvaging worn tools and gages is generally accepted by the production industries of today but it still seems that the advantages of plating new tools are still not recognized by many. Many tools are manufactured and used and then salvaged, whereas, the same tools plated when new would have lasted five to twenty times as long. It has been found that it is much easier to include the plating in the original cycle of manufacturing operations than to make a separate job of it.

As a preliminary operation prior to chromium plating at the Lincoln Park plant, each workpiece is carefully sand blasted in the sand blast unit shown in Fig. 2. The machine shown in this illustration is a No. 33 Type EQ-1 Pangborn unit and is provided with flap-covering openings on each side to accommodate long workpieces. At the left of the same illustration, a Worthington 2-stage compressor which provides the necessary air pressure in the sand blasting operation is shown. The sand blasting operation provides the necessary clean-

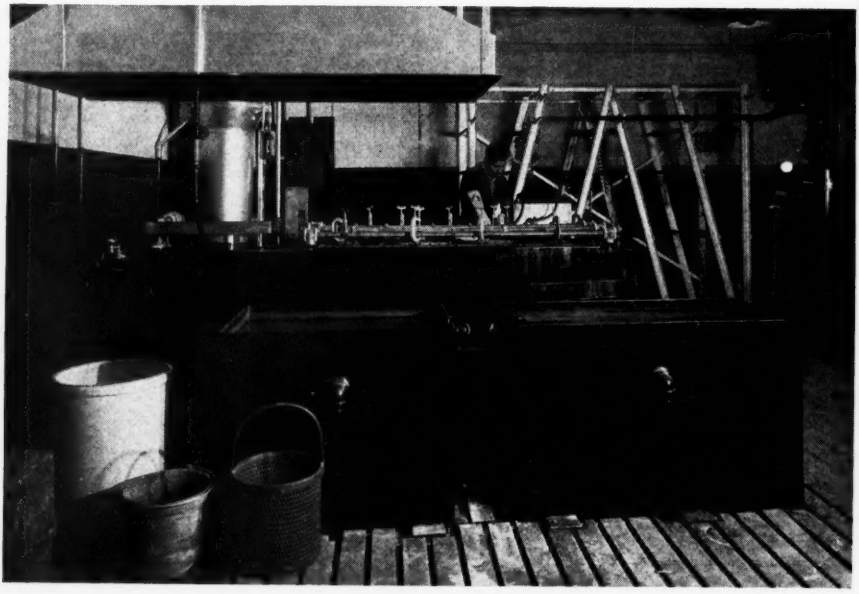

Fig. 3—A view of the chromium plating department showing the rinse tanks in the foreground.

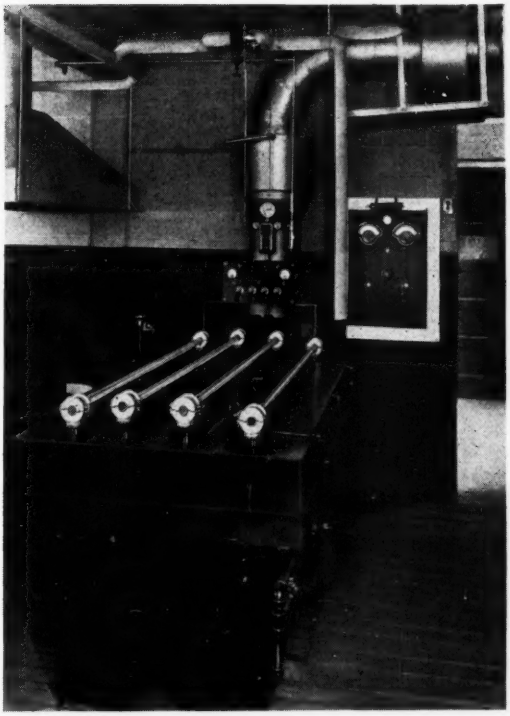

Fig. 4—Illustration showing chromium plating tank. The bus bars can be moved to either side since they are connected to the main supply lines by means of flexible couplings.

ing and prepares the surface for the deposition of the chromium plating.

After the workpieces have been carefully cleaned by sand blasting, they are transferred to the chromium plating department, a view of which is shown in Fig. 3. Practically every workpiece represents a special job and requires a special rack for the plating operation. These racks are designed and formed by an engineer of the Lincoln Park company and are stopped-off with Michigan Chrome "Supreme" stop-off lacquer.

Located in the foreground of Fig. 3 are two rinse tanks and behind them is located the chromium plating tank. A close-up view of the chromium plating tank is shown in Fig. 4. The tank, which was built by the R. C. Mahon Company, is 66 in. long, 36 in. deep, and 24 in. wide and all tile lined. This tank is constructed so as to accommodate vertical heating coils. A box type solution surface ventilator provides the means for exhausting the chromium fumes at the point of origin, thus favorable working conditions are maintained in the chromium plating department. The exhaust fan which works integrally with the exhaust system is capable of exhausting 2,200 ft. of fume laden air per minute. The ventilator stack through which the harmful fumes are exhausted is equipped with a moisture extractor arrangement which baffles the fumes before they reach the exhaust fan.

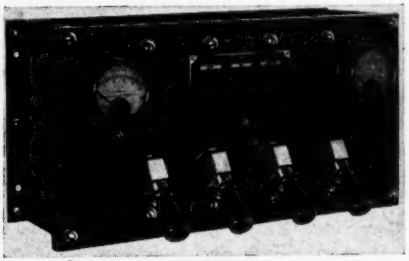

Fig. 5—A close-up view of the Udylite rheostat which provides the means for close control of the current and voltage.

A Kane gas fired 6 H.P. boiler is used to provide steam heat for the solution. The Kane unit is complete-

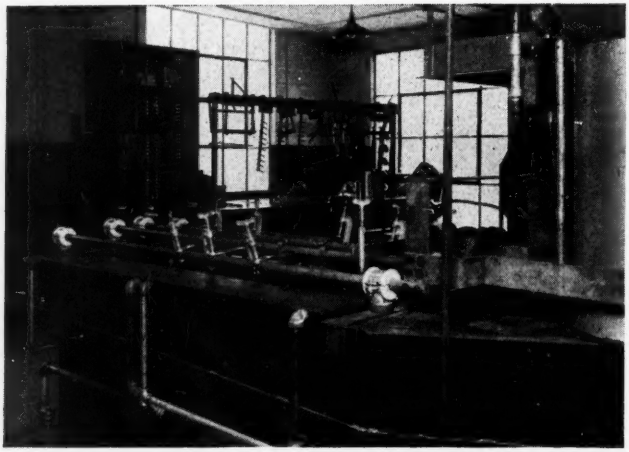

Fig. 6 — A general view of the chromium plating department showing the rack holder in the background. Practically every workpiece requires an individual rack.

ly automatic and requires very little attention. The temperature of the solution is controlled by a Powers regulator within two degrees of 130 degrees. The bus bars which lie longitudinally along the top of the tank are connected by flexible couplings, a feature which permits them to be easily moved to the side when it is desired to place large workpieces into the plating bath.

A 10 H.P. Chandeysson generator provides the necessary current for plating the workpieces and a Udylite rheostat is used for carefully controlling the current and voltage. The Udylite rheostat smooths out current "peaks and valleys" by providing close control over the current entering the plating bath. This instrument enables production to be stepped up by reducing plating time through maintenance of maximum permissible current in the tank. It is a cam-type precision instrument with self-cleaning switches governing resistors made of helically coiled, nichrome wire. The coil brackets have large radiating surfaces, thus insuring cool resistor contacts. A close-up view of the Udylite rheostat is shown in Fig. 5. The average rate of deposition of chromium plate is 0.001 in. per hour and the average plating circle is from five to eight hours.

The close control methods employed in the hard chromium process have been resolved almost to laboratory methods with the result that more and more information is being compiled on the subject of hard chromium plating and it has also been found that many difficult jobs of ten years ago are but ordinary jobs today and new uses of the hard chromium plating process are constantly being revealed. It may be that many of today's impractical jobs, such as new types of cutting tools, will be merely part of the day's work for the plater of tomorrow. At any rate, Lincoln Park Tool and Gage Company will continue to make every effort and apply all their resources to the solution of such problems.

"M. S. A. Eye Protection". This is the title of an 8-page folder in which eye equipment of practically every description is described. This folder is being issued by Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh, Pa. The folder includes descriptions of goggles, spectacles, lenses, helmets and so on. Copies of this informative new publication are available by addressing Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

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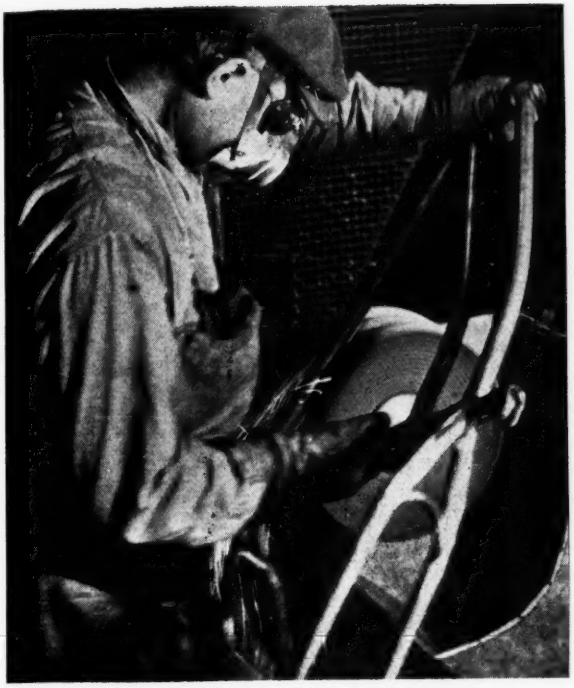

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Testing The Modern Finish

By Ray C. Martin

THE true value of a coating material lies in its ability to withstand the elements and abuse through usage and its retention of form, color, gloss, and so on, after the surface on which it has been applied has been in service.

It is the author's hope that Industry will derive generalities of testing procedure from the investigations outlined herewith. Suppliers of coating materials with their well equipped laboratories of today play an important part in the evaluation of finishing materials. The source of information, through the use of complicated and extensive testing devices, should indicate probable life and wear resistance of such finishes. While Industry should be concerned about the evaluation of finishing materials, its true value involving a means of breaking down the finish, should be pre-determined by the supplier of such coatings.

Certain test procedures which follow may not be attempted by Industry and are included herewith only with the thought of completing a true test-value. Any ratings as given are arbitrary.

Maintain a Standard

Whenever Industry adopts a new color it should be set up as a master standard. Any and all succeeding shipments should be matched against such standard for color and viscosity, and any other value desired. The maintenance of proper wet samples for color is always in dispute because of such variables as pigment float, pigment settling, and so on. It would appear that if Industry were to select definite color coatings which were to be associated with products of their manufacture that a wet suitably sized sample (unreduced) be kept in a glass container. As succeeding shipments of this color are received, it should be sampled and color compared with the standard sample. A sufficient amount of the standard, consistent with making color comparisons should only be used. The standard and shipment should be sprayed on a metal panel or glass surface. The standard should be replaced periodically with approved material from a shipment so that features of color floating or pigment settling will be overcome. Standard sprayed metal panels or glass plates may be kept. These, in like manner, should be frequently changed to more recent approved shipments.

Clear materials may be kept in the same manner. Sprayouts should be kept on brass plates if the coating enters the metal finishing Industry. It is better to retain panels which have previously been stained and filled. The sanding sealer, clear and flat finishes may then be compared; standard against shipment. For color and viscosity, clear materials may be kept in sealed tubes.

In every instance where comparisons are made against a standard, the identical standard reducer-thinner should be used.

Odor

The odor of coating materials does not receive very much concern in Industry. Where lacquers and lacquer thinners are being applied in close confinement, however, the odor is of some concern. Benzol and similarly toxic liquids are sharp and detectable by their nauseating effect. A simple test is the smell test and an apt nose

will detect the difference between materials. In reducer or thinner detections, a pour onto a blotter or similar paper will, in captivating the liquid, permit of a prolonged "smell test". Reducers or thinners and lacquers which possess a sharp odor may be "perfumed" by the addition of an essential oil. All sharp odors are not toxic.

Viscosity

Viscosity, consistency or body is the resistance of such a material to deformation or flow. This resistance is associated with exerted force. The matter of viscosity or body should be observed by Industry and every shipment of coating material that is received should be checked against the standard for viscosity. Limitations as to reducer or thinner additions to attain proper spraying or dipping consistency should be strictly adhered to. A heavy bodied material, which necessarily requires better than equal volumes of reduction, is false economy. The resultant film will not be as durable as the film generally attained by the addition of a volume of reducer-thinner up to equal that of the material being reduced. In other words, a heavy viscous solution which may require twice the volume of reducer-thinner will deposit a film thickness of but 1/3 that of the original materials' solids. The lower the viscosity of a material, the lesser the internal friction and therefore the better the flow.

Standard glass tubes are available for comparative body tests of clear liquids. To test the viscosity of such liquids, a standard bodied material is used and the sample to be tested is placed in the same size tube. Both are kept at 80 deg. F. by placing in a water bath and both are moved by inverting the hand. The bubble which will flow through the movement should be constant in order to check viscosity.

All pigmented materials should be checked in a No. 4 Ford Cup, electro-viscometer or similar device. A standard viscosity determination, with slight variation, should first be determined. Temperature control of material while running the viscosity is important.

Miscibility

The miscibility or ability of a reducer-thinner or of a second material to become intermixed should be determined in a small way before any attempt to admix a larger volume. Certain materials have a greater tolerance for certain liquids. This should be determined beforehand. Lacquer materials should be reduced —thinned with a combination of volatile liquids which are recommended by the supplier of the lacquer; this also holds true of synthetic enamel reduction. Exacting results will then be attained, as the influence of a greater proportion of an ingredient, as for example, petroleum hydrocarbon to the ester (solvent) content (in lacquers), will disturb the ability to secure proper spraying results at, for example, equal volume reductions. It is money saved to secure exact leveling in a sprayed film, for then the rubbing or polishing is at a minimum, whereas, through the use of an unbalanced reducer-thinner, the orange-peel effect which usually results, requires greater effort to secure a proper surface.

Reduction

Reduction or thinning goes hand in hand with miscibility. Reduction or thinning is, and justly should be, a general physical requirement in the application of coating material. A lacquer or synthetic enamel should always be reduced-thinned before application. Materials are sometimes shipped at "spraying consistency" and should only be used under such conditions when spraying pressure or dipping body will permit wide limitations. Volatile materials as contained in lacquers will evaporate and the

resultant viscosity will vary. For this reason, it is better to reduce-thin before use. Reduction of any such coating material should be in accordance with a manufacturer's directions and, to attain the best results, with a manufacturer's recommendations of reducer-thinner. In this connection, reducer-thinners foreign to the material being reduced-thinned (of another manufacturer) may require, if tolerable, a greater amount and may tend to disturb (produce a pebbly effect) the final appearance of the film. Reduction-thinning is important and the least amount of reducer-thinner required to obtain exacting results will permit of attaining a film which possesses the greatest solid content and make for fullness and resultant durability in a coating.

Sprayability

The working properties or ability of a coating material to be handled properly under spraying, brushing or dipping application is associated with the above subjects of viscosity or body, its amount of reduction-thinning with the proper material and the miscibility or tolerance with that liquid. With proper spray equipment and the proper reduction and proper reducer-thinner, a material can be considered exacting when a smooth, level, glass-like film, free of orange-peel, is secured. There are many film conditions and film failures attributed to improper application. In general, a product is exacting when it possesses the ability to produce a smooth and level film. Associated with spraying properties is the ability of the material to level out properly. In lacquer, the writer must refer back to the use of the proper reducer-thinner. Oftentimes the use of improper reducer-thinner wherein an orange-peel effect is noted, the reference is to improper spraying of the lacquer. Coating materials must become properly atomized and in this regard only the use of proper reducer-thinners will answer. Synthetic enamels, in like manner require volatiles or liquids which permit proper leveling of the film. The composition of lacquers and synthetic enamels clearly indicate a drying or part drying by evaporation of contained volatiles. Proper spray equipment is assisted by the presence of proper evaporating liquids to attain a film of smooth continuity.

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Porcelain Enameling Experiences and Developments in Australia and United States, Part III

By Fred M. Burt

THE condition of the major items of equipment at Metters Ltd. and also the first replacements that were made were two of the main subjects described in the foregoing instalments of this series of articles. The first changes that were made were not intended to complete the modernizing plan but only indicate a logical development of changes. This series of articles is written primarily to show the logical ways and means of proceeding from an imperfect and out-of-date method of manufacturing, as quickly as possible, to convert a plant into the last word in modernity and efficiency.

Practically all of the changes made in the plant of Metters Ltd., Sydney, Australia, were made in one year's time, but the changes made in that time were but a part of a long time plan which would eventually bring the plant to the production capacity and efficiency desired. A condition like this can be brought about much more easily when equipping and starting a new plant as compared with the case where production cannot be interrupted at all and where it is imperative to increase production, cut costs, improve quality, and introduce new products at the same time.

In following the outline given in Instalment I, the next subject of discussion is equipment.

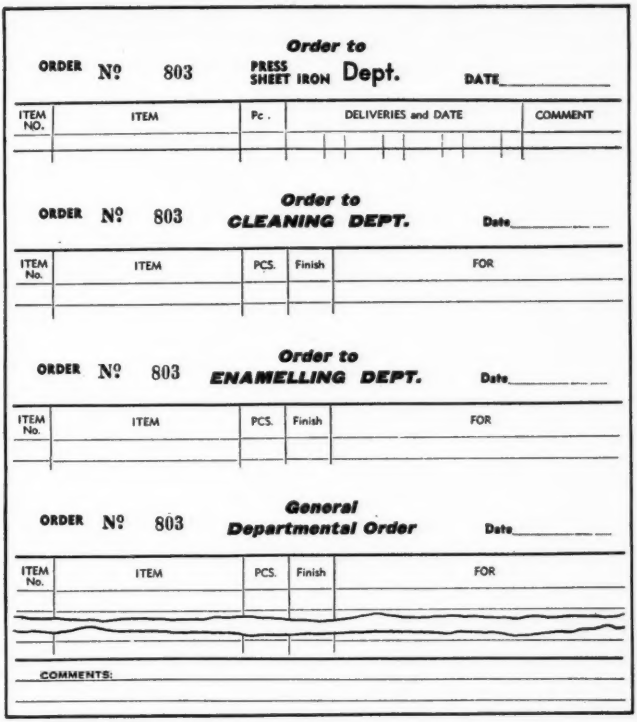
(d) What system of planned and recorded maintenance is used, if any? Remedy any deficiencies.

With no concise, easily accessible records available, the first step was to start a looseleaf notebook record. There is a two-fold purpose in keeping such a record. One purpose is to have a means of seeing that all equipment is serviced and otherwise maintained and improved to work efficiently. The other purpose is to have records to show what service

ORDER № 206 HOLLOWWARE SHEET IRON STORE ORDER Date_____

ITEM No.	ITEM	Pcs.	Finish	COMMENT

Fig. 1—The requirements for incoming hollowware are analyzed for a Production Order and are made out on this form. Size 8¼x10¼ inches.



Order to

ORDER Nº 803 PRESS SHEET IRON Dept. DATE_____

ITEM NO.	ITEM	Pc.	DELIVERIES and DATE	COMMENT

Order to

ORDER Nº 803 CLEANING DEPT. Date_____

ITEM No.	ITEM	PCS.	Finish	FOR

Order to

ORDER Nº 803 ENAMELLING DEPT. Date_____

ITEM No.	ITEM	PCS.	Finish	FOR

General

ORDER Nº 803 Departmental Order Date_____

ITEM No.	ITEM	PCS.	Finish	FOR

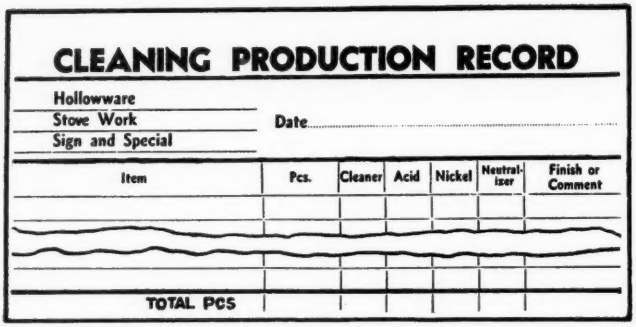
COMMENTS:

Fig. 2—The General Departmental order sheets are made in quadruplicate. Size 8¼x10¼ inches.

was given per dollar of cost of original price and maintenance. The use of a looseleaf notebook record can be found invaluable in determining what materials should be bought for replacement or what new equipment should be purchased.

It was possible to make a complete record of original cost, period of use, and performance figures after each unit of permanent equipment was marked and identified in the records by a department symbol and unit number. In addition, the condition of the unit on the date that the record was made was also noted. The divisions kept in this record were as follows: (C) cleaning department; (A) application; (T) transportation; (F) frit, collecting, weighing, mixing, smelting; (M) milling; (S) sign and stencil making, decalcomania, silk screen processes; (B) burning; (P) pickling, storage, shipping; (O) office, laboratory, supervision, records.

As an example of the way the record was kept the new furnace and smelter sheets showed exact bills of material used, source, cost, time required to get delivery, time of erection, start of operations with a notation of blueprint number and where the blueprint was filed. Later, when a smelter needed a new lining or a furnace a new muffle, this record would show the number of smelts from the old linings, the number of days of operation per muffle and this could be broken down to cost per smelt. Production standards and fuel costs were also recorded. When any maintenance or repair work was done a report was immediately submitted to the office where it was recorded by an office assistant, thus a record of invaluable use for future reference was built up and at the same time guess-work was eliminated. If such a report had been available when the modernization work was started, very much time and money would have been saved. By keeping such a record as just described, the writer was



CLEANING PRODUCTION RECORD

Hollowware
Stove Work
Sign and Special

Date.....

Item	Pcs.	Cleaner	Acid	Nickel	Neutral-izer	Finish or Comment
TOTAL PCS						

Fig. 3—As the ware passes through the pickle room the Cleaning Production Record is carefully noted on cards of this type. Size 5x8 inches.

assisted many times in anticipating repairs and providing materials for the repairs when it was planned to decommission and repair them. Lubrication and other periodical and systematic servicings were scheduled and checked by having an operator sign a schedule sheet when a servicing was completed.

(e) Is the plant properly laid out for the best production flow?

This subject was covered in the plant layout analysis and in the subsequent time and motion study.

(f) What is the condition of transportation between operations?

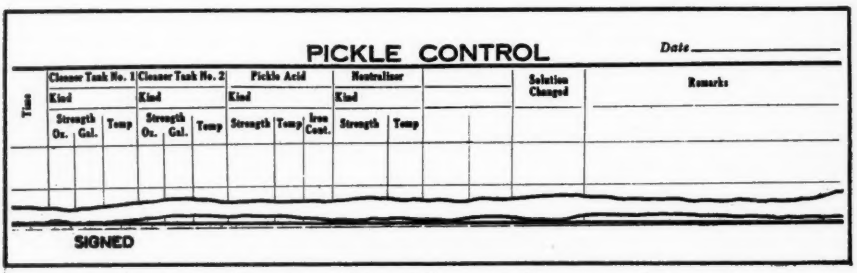
This problem was dealt with by providing an adequate number of trucks and racks and by the installation of continuous dryers. In designing the trucks and racks, great care was taken to analyze in every detail the most desirable design, dimensions, and weight capacity. Each unit was plainly marked for the particular work for which it was to be used. All of the units which were used for handling coated wares were provided with ball-bearing rubber-tired wheels. The trucks which were used to convey hot ware from the furnaces were metal lined.

(g) What equipment constitutes bottle-neck, if any?

At first, this particular situation changed from day to day from pickle room, to heavily fabricated materials, furnaces, truck, and storage and so on, but was finally brought around to the furnaces. The installation of new furnaces corrected this problem to a large extent.

(h) What are breakdown danger points to anticipate which halt production?

Since there were a large number of such points possible, the equipment maintenance analysis showed in detail where such breakdowns might be anticipated and permitted the provi-



PICKLE CONTROL

Date.....

Time	Cleaner Tank No. 1			Cleaner Tank No. 2			Pickle Acid			Neutralizer				Solution Changed	Remarks
	Kind			Kind			Kind			Kind					
	Strength Oz.	Gal.	Temp	Strength Oz.	Gal.	Temp	Strength	Temp	Iron Cont.	Strength	Temp				

SIGNED

Fig. 4—Cleaning and pickling solution strengths are recorded on this type of card. Size 8x5 inches.

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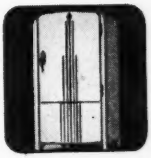


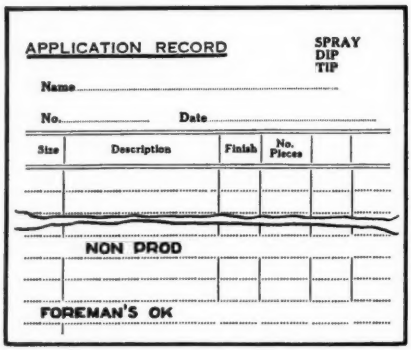
The Egyptian Lacquer Manufacturing Company
Rockefeller Center, New York, N. Y.

EGYPTIAN FINISHES

sion of spares, replacement parts, emergency supplies, substitute equipment and production detours. As past experience has shown that the average breakdown comes from the most unexpected source, the same past experience is called upon to imagine and list every possibility by visualizing every operating step.

3—Raw Materials

(a) What materials and in what


APPLICATION RECORD

SPRAY
DIP
TIP

Name.....

No..... Date.....

Size	Description	Finish	No. Pieces		
	NON PROD				
	FOREMAN'S OK				

Fig. 5—After inspection, the workpieces are assigned for ground coat application and the one in charge of this operation fills in the card with the required data. Size 3½x7 in.

form? From where? How received and how stored? What are the storage capacities? How are they handled?

This called for a new and complete listing of everything that was bought regularly, with prices, source, why it was bought, method of ordering, time of delivery, certainty of uninterrupted service, method of delivery and handling. The consumption of raw materials for the past year was analyzed and the future requirement was estimated. Materials such as chemicals and steel were inventoried. The available storage area was charted and greatly re-arranged so as to use this limited space to the best advantage and to use the cubic content of the area to a good advantage. The disregard of cubic content of an area is probably one of the most common faults in storage planning.

Another vital point was to arrange the storage space so that large, bulky material was farthest removed from operating spaces. It is a very common error to quickly select a place for storing a bulk of incoming material without advance planning to place it exactly where it should be. In this plant, one of the greatest expenses was that of hundreds of man-hours for storage rearrangements whereas, if specified locations had been laid out with good planning no extra expense whatever would have been entailed.

(b) What positive provision, if any, is there to prevent material shortage from interrupting production?

With feldspar from Sweden, Borax, oxides from the United States, tin oxide, other oxides and steel from England, and with deliveries as much as five months after placing orders, it became necessary to build up stocks of material to operate for at least three months. In the U.S.A. this probably does not apply so fully but the writer has seen very heavy expenses occasioned by the lack of unforeseen contingencies. The cost of a shutdown is much greater than the interest on investments in protective stocks. Many of these statements are so well-known and commonplace that they might not seem worthy of repetition, yet they cover the faults that are the commonest. It would be an invaluable experience for many an American manufacturing executive to operate for a short time under Australian conditions.

(c) Is full value received from all material bought?

(d) What are wastes and salvages?

(e) What are the wastes and salvages on accessory supplies?

These three items cover practically the most detailed responsibility of the

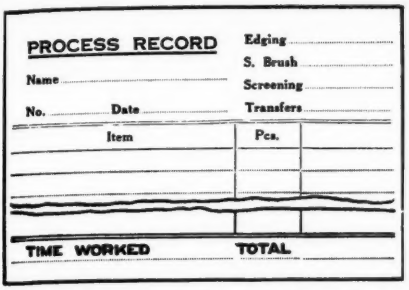


Fig. 6—Processes requiring individual production are recorded on cards of this type. Size 3½x7 inches.

operating executive. This, together with payroll, is where a large portion of the company's expenditures go. The mark of a good executive is to buy adequately but without overbuying and then making sure that every dollar's worth of products coming into the plant shall be used fully and efficiently.

Invoices for everything bought, came to the department office for an okeh. Before the invoices were returned, the data on each was taken and recorded as follows: equipment under the maintenance record; periodical and constant supplies in a loose-leaf notebook, and small miscellaneous supplies in another book. A manager with a good memory and mind for detail will catalog all these items in his head by checking over left-overs, salvages, wastes, and residues and will make certain that a dollar's worth of value will be derived from a dollar's worth bought. Before the writer's arrival at Metters Ltd. a partial clean-up had been made with some 15,000 stove parts, a greater portion of which were defective and were being kept in hopes of reworking or destroyed. The policy was adopted to "finalize" everything as it went through the plant. The ware was either useful, could be reworked to be made useful or was junked.

New wash-off tanks were installed to wash-off wares that had dried enamel on them. Because of the dried enamel, the ware was unfit for burning. Systematic inspection was provided and the ware was constantly collected, washed off, the tanks cleaned out, and the bulk of enamel reused in a dozen different ways. As an example of the way an average employee, and some times even a foreman, will overlook possibilities of savings is illustrated by the bit of stratagem employed on the mill and smelter day foreman. After selecting the proper time and a clean spot on the mill room floor, a little pile of white enamel frit worth about 48 cents was laid down, in another spot 6 cents worth of 8d nails and in a third place a 25 cent piece. Then a confederate called the foreman in and stood talking to him where he could see all three spots. Spying the 25 cent piece he picked it up, exclaiming at his luck. Shortly after, he told one of his men to come in and pick up the nails. The frit was at the edge of a truck aisle and remained there until a truck ran through it. It was cleaned up during the regular daily clean-up. The next

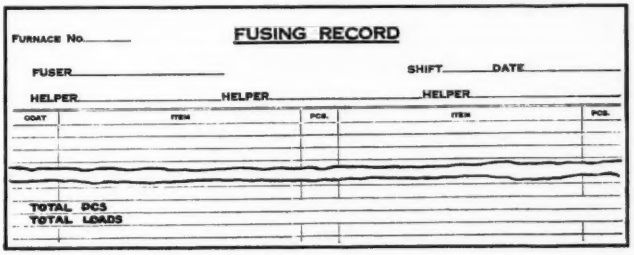


Fig. 7—The fusing production is recorded on sheets of this type. Each shift on each furnace uses a different record sheet. Size 8¼x7½ in.

morning at a foreman's meeting the writer requested the return of his quarter which would not have been done if the frit had been cleaned up. At the meeting, the foregoing anecdote was pointed out as an example of a common habit of not paying attention to saving everything possible for which money was paid out and that an average man will save a few

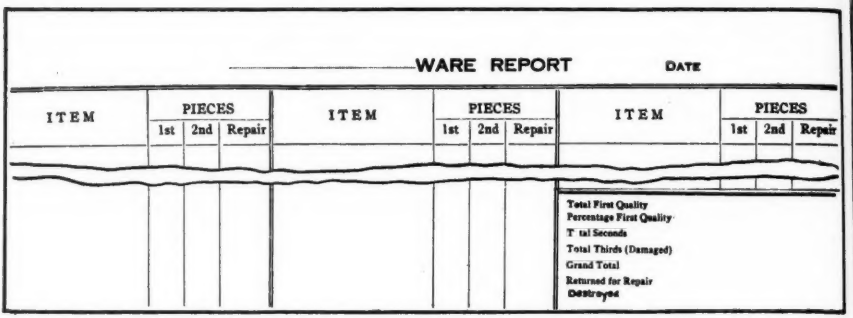


Fig. 8—All finished wares are recorded on reports of this type. Size 10¼x8¼ inches.

nails but will not clean-up expensive chemicals. There is usually so much of the chemical that the average man loses sight of the fact that values run anywhere from 1 cent to $5.00 per pound. It is very likely that in many enameling plants it would be good to have a "snooper" whose sole job was to check waste, and to be in charge of storage, delivery of materials to operators, and all plant good housekeeping operations.

4—Products and Their Relation to Orders and Production System.

(a) List items and their finishes. Reference specifications for use by production foremen were drawn up on all wares with all changes kept strictly up-to-date. A sample of each stove part was labelled and placed in an easily accessible rack. This arrangement gave an exact illustration of edgings, lettering, colors, coats, decals, and so on.

(b) How are orders and anticipated requirements translated into production orders?

(c) What provision is made for full coordinated production flow, if any?

(d) Is the production flow under one control and combined record or several?

(e) Determine shortest possible production cycle and each individual piece.

(f) How many special rush orders? Detail on same.

(g) To what extent is it possible to eliminate storage build-up of units between operations.

(h) List storage and handling accessories. Would other handling accessories be of any advantage?

Considering that there were always from 600 to 1000 different orders always waiting and many of the orders badly mixed, and marked for immediate delivery, it was clearly indicated that a very efficient production system would be required. New forms were printed and an adequate though simple system was installed. The system and the forms used at Metters Ltd. can be used to handle production efficiency in practically any enameling plant.

First on the list of forms that were drawn up was the Hollowware Sheet Iron Store Order. This sheet was

furnished in triplicate. An illustration of one of these sheets is shown in Fig. 1. The requirements of incoming orders for hollowware were analyzed for a production order and at least once daily was made on a form such as this and the word "hollowware" checked. The requirements for stove parts, signs and other articles were listed and tabulated in the same fashion and the word "sheet iron" checked. These forms were consecutively numbered with 50 sets to a pad and a different series of numberings assigned to the four classifications. Later a fifth classification was added which included all parts to be enameled which were fabricated outside of the Metters plant.

The white form was sent to the enameling department, the yellow to the stamping of metal fabrication, and the blue form was kept by the issuer. This record production requirements furnished the data from which daily production orders were planned. The urgency for items was noted under "comment."

Another form designated as a General Departmental Order was made out in quadruplicate. An illustration of the four forms is shown in Fig. 2. The first sheet was headed General Departmental Order and was kept in the enameling office. When the order was completed the form was filed with pertinent comments written in. The second sheet of this form was blue in color and was sent to the proper enameling foreman. The third sheet was pink and went to the painting department. The fourth, a yellow sheet, was sent to the press or sheet iron department as a delivery order or record sheet on items ordered on the previous store order. This order in quadruplicate was the basic record of what was to be run, when, the finish and process, with any special instructions.

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IV		1.2	—3.4	VII	11.0 —13.5
V		0.9	—1.5	(*zinc only)	

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As the ware passed through the pickle room, the cleaning production was recorded by each shift on Cleaning Production cards. An illustration of one of the Cleaning Production Record cards is shown in Fig. 3. This was a record of gross production.

Cleaning solution strengths and other data was kept on a Pickle Con-

DEFECTIVE WARE REPORT

DATE_____/_____/1938—BY

RETURNED FROM

	CHIPPED, in Enamelling		Iron Blister
	To Storeroom		Enamel Blister
	To Assembly		Warped
	In Assembly		Off Color
	In Delivery		Scratched
	After Delivery		Craze or Hairline
	Paid Replacement		Dirty Enamelling
	Cause Unknown		Decoration / Edging } Fault

COMMENT:—

	DISPOSITION, Destroy		Enam. Repair or Recoat,
	De-Enamel		Straighten

BY

METTERS, LTD.

Fig. 9—This report is gummed on the back for placing on returned work. Size 3x3½ inches.

trol card, one of which is shown in Fig. 4, by a chemist in the laboratory. Analysis of the solution was made in the early morning and again just after noon and again in the late afternoon. At these times provisions were made for solution strength or special orders.

After the wares were inspected, they were assigned for ground coat application to the proper operator and were delivered to the application department where required data on an Application Record was filled in. An illustration showing one of the Application Record cards is shown in Fig. 5. A summary of the daily application records for each shift was compiled from cards such as this on a Dipping Department record sheet. The same sheet was used for three classifications — kitchenware, stove work, and sign and special. For the latter two, the word "dipping" on the card was scratched and the other inserted.

Processes requiring individual production were recorded on a Process Record card on which the proper operation was checked. An illustration showing a Process Record card is shown in Fig. 6. The individual production records were listed on special total sheets showing comparative operator productions as an aid in stepping-up production. The average Australian production per operator was only from one-fifth to three-fifths that of an ordinary American production. One cause of this was the fact of short runs and the retraining of the personnel in entirely new methods.

Fusing production was recorded on Fusing Record sheets, each shift on each furnace using a separate record sheet. An illustration showing a Fusing Record sheet is shown in Fig. 7. The fusing records were compiled and summarized daily on large sheets similar to the application summaries.

All finished wares were recorded on a ..... Ware Report, an illustration of which is shown in Fig. 8. All articles of kitchenware were carefully inspected and all rejected parts were returned to "reworking" storage shelves or to the ware hospital. All items sent to the ware hospital were scheduled to be reworked within 24 hours. All other ware was sorted in the inspection end of the shipping department and a daily report was rendered on an inspection sheet. All other wares went to special inspectors in a reserved section, which was well equipped with ware holders such as racks and trucks. At this point it was determ-

ined whether the ware would pass on for use, return for reworking, to the hospital or to the scrap pile to be destroyed. It was found that one of the vitally necessary items for smoothly operating, uncluttered production was to immediately finish up the ware or to junk it.

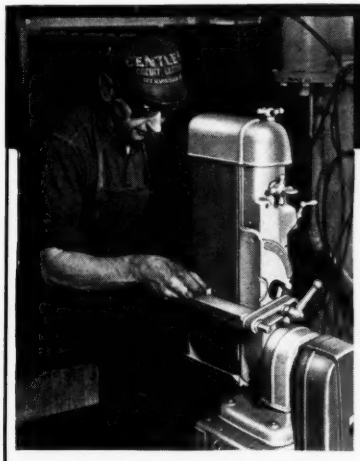
A Defective Ware report slip with gum back was put into use for stove parts which were returned by the purchaser of the stove. An illustration showing one of these report slips is shown in Fig. 9. Every returned part had one of these slips filled out and attached to it.

A daily Smelting and Milling record was kept on cards similar to those shown in Figs. 10. and 11. The information on these records was summarized and the weekly and monthly reports. The mixing records of smelts was recorded and summarized to show the exact weekly and monthly consumption of smelts.

A form inaugurated and found invaluable by the writer was the Special Instructions form 4 in.x5 in. and made up in pads of thin white and pink paper with each set of sheets consecutively numbered. A large number of 3 in.x4 in. cards of different colors were also purchased. Carrying several of these at all times, the writer and his assistant would jot down notes of every need that presented itself. When it was something that could be transferred at once, the card was transferred to a special instruction slip and the first sheet was sent as an order or inquiry. These cards were for plant use only. The pink sheet was dropped in a desk drawer as a reminder for follow-up and was destroyed as soon as the need was past.

(i) How are products stored, packed and shipped?

A large addition to the storage and shipping department building was



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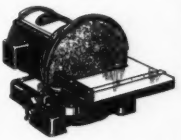

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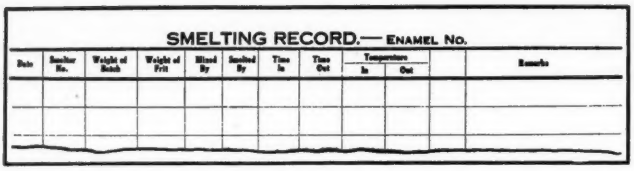

Fig. 10—The information recorded on this card is summarized on weekly and monthly reports. Size 8x5 inches.

made. New sorting tables of a very convenient size and height were installed. Rubber mats 4 ft.x8 ft. were placed on the floor wherever there was a danger of ware dropping. All dead stock was dragged out and moved and sold at what it would bring. Dozens of high racks with varied size bins and second-level runways were built. An entirely new arrangement of storage and perpetual inventory was instituted. Kitchenware had been wrapped only with a very thin white paper and after being in storage for a while a large percentage needed rewrapping before shipment, consequently a heavy Kraft paper was used with different colors for different grades of ware. New and highly attractive labels were designed and put into use.

5—Personnel

(a) Make up organization chart showing department organization with detail of personnel.

(b) What are individual duties and any unnecessary overlapping?

(c) What are working hours, shifts, direct and indirect labor?

(d) What are operations on wage incentive basis? Should others be placed in this classification?

(e) What cost and production standards have been set up through time and motion study? Remedy any deficiencies in same where needed.

(f) Is direct productive labor fully serviced with indirect labor, materials, equipments, and accessories?

The production analysis enabling the adoption of the aforementioned system and equipments answered most of the above. A chart was made and framed, showing the complete personnel, duties, hours, wage rates, and so on to aid in visualization of operation improvement and organization and to learn names and other important details. A summary of the weekly pay roll was available from the pay roll department. All work was on straight daily pay and these rates were largely set by governmental wage awards calling for certain minimums on various wage classifications.

6—Operating Costs

(a) What are existing unit costs?

(b) If none available, how can they be determined?

(c) Do supervisors know these costs and can they control same?

(d) What are sources of waste and scrap losses and how controllable are they?

With new enamels, the cost used as a basis for quotations and sales prices was of little value consequently certain items were selected and a careful cost record was then compiled. All materials pertaining to cost control and saving were taken up and dis-

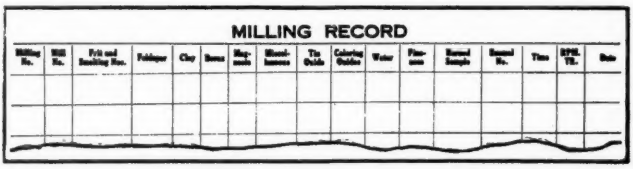

Fig. 11—The mixing records of smelts are summarized from cards like this one to show exact weekly and monthly consumption of chemicals. Size 8x5 inches.

cussed at foremen meetings so that each foreman would be acquainted with all the available data that he might have a standard for cost production. Too often, much of this information is withheld from foremen when the knowledge of same will some times give startling results.

7—Production Records

(a) What fluctuation in production loads?

(b) How far in advance are they scheduled and by whom?

(c) What planning methods are employed by supervision to anticipate requirements and to use materials, equipment, and personnel most effectively?

(d) What relation is there between production for stock and current orders?

(e) What are the normal requirements and what are the most economical runs possible by the equipment set-up changes?

The writer has always found that the above is a mental problem, or in other words, the analytical record of the man in charge. It is his problem to know all of these things in detail and to coordinate, plan, and anticipate changes from day to day.

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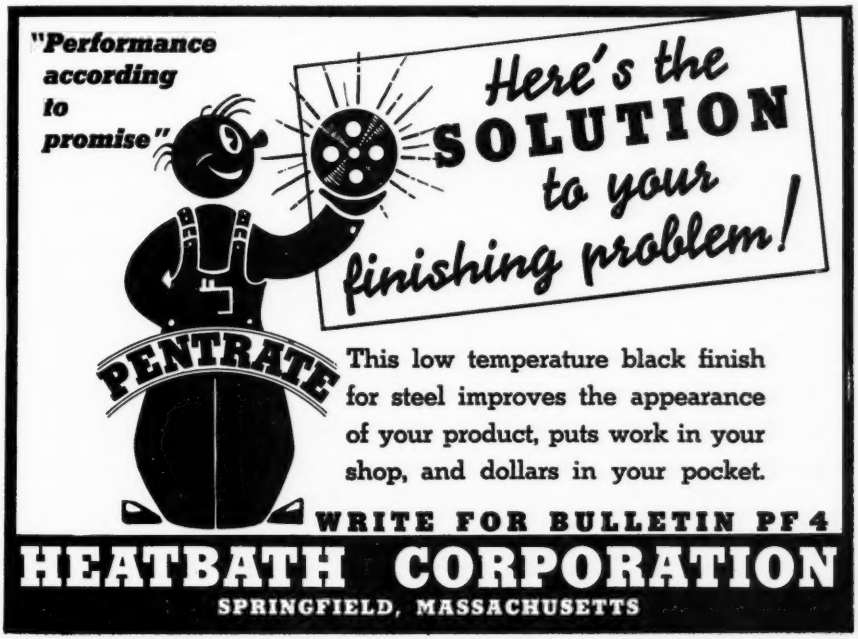
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Barrel Finishing of Metal Products

Factors in cutting down and reducing surface areas by the barrel method and the burnishing of hardened steel parts.

By H. Leroy Beaver

THERE are two essential factors to be treated in this paper. First is the solution of a problem that has perplexed many barrel operators in connection with cutting down operations performed with oil base or with water base, both of which, of course, are combined or rather used as carrying mediums for the abrasive employed in the operation.

H. Leroy Beaver

The first proposition involves the use of kerosene oil and an abrasive on parts either in a high and narrow type of barrel, which is considered the best for the purpose, or in an oblique tilting type of barrel. When properly carried out, this operation is comparatively simple. Kerosene oil is the medium most generally used but it is objected to by many due to its odor, but this factor may be largely overcome by using a very similar product known mostly by oil producing companies as Mineral Seal or High Flash Kerosene. By either name, both of these oils are practically odorless as compared with kerosene. There may be times and on certain products that a heavier oil seems to be necessary and in such case an oil known as Stock oil which is also odorless may be used. Stock oil is considerably heavier than either the Mineral Seal or High Flash Kerosene and very often a fixed proportion of Stock oil may be added to either of the lighter oils to build up their body. It must always be borne in mind, however, that the heavier the viscosity of the oil the more the operation will be retarded for the very simple reason that these heavier oils while better holding the abrasive medium in suspension at the same time will, in a large sense, act as a lubricant between the abrasive and the parts being reduced. So that, all things considered, we would unhesitatingly recommend the lighter gravity oils either Kerosene, Mineral Seal or High Flash Kerosene.

Many operators who use combinations of these light oils and abrasives complain that they have trouble with pitting, and in many cases where we have investigated we invariably have

found one condition that, when eliminated, overcomes the difficulty. When oil and an abrasive are used in combination, water in any form must be entirely eliminated. Even minute quantities of water when found in a cutting down solution will extend the chances of pitting. In the vast majority of cases where water is found in the solution it is not added intentionally but altogether inadvertently. Parts, before being placed in the barrel for cutting down, are often given an alkaline cleaning or pickling either still or electrolytic, and from the cleaning solution they are given a quick rinse and thence transferred directly to the cutting down barrel. On parts that have been case hardened before the cutting down operation, where water is the quenching medium, the parts are heated, quenched, taken out of the quenching bath and when still wet, are placed in the cutting down barrel and operated with, let us say, light oil and emery, as that is by far the most popular combination especially for hardened steel parts.

Now while it might seem that the small amount of water that adheres to the surface of the parts from either of the operations just described above, would be of little or no importance, it will invariably be found that in eliminating even this very small proportion of water that the pitting will immediately stop.

There is, of course, a technical reason for this apparent incompatibility between oil and water as they would be combined in such a cutting down operation, but we are endeavoring to keep this series free, as far as possible, from involved technical equations and for this reason will not dwell on this phase. If any operator who has experienced this matter of pitting of steel parts while cutting down with oil and abrasive will remember to use scrupulous care to avoid water, his problem will solve itself. But some operators say—"How can we keep away from this water situation?" Our suggestion is that on parts that are to be cut down just as they come from the press shop, no effort be made to clean them, as the oil with which the original sheet was slushed will combine with the lighter oil and will in no sense interfere with the operation. In cases where the parts are taken from the quenching bath, if no other method is available, we would suggest drying with fibre meal before placing in a cutting down barrel. Of one thing the operator may be definitely certain and that is that if water finds its way into a cutting down solution of oil and abrasive, then pitting may be definitely expected.

In one of the cases where we were called into consultation, the operator insisted that no water could find its way into his oil and abrasive cutting down solution, but in checking through on his operations we found that there were times when the work came from the cutting down operation, was cleaned in an alkaline cleaner solution and inspected and parts requiring further operation were again placed in the cutting down barrel for an additional run. The operating cycle here called for an alkaline cleaning process before the second operation and it was in this cleaning operation and a subsequent rinse that the parts were placed in the cutting down barrel wet and pitting invariably cropped out, because it was here that the water entered in. In another case, a barrel was used intermittently for water and abrasive tumbling and oil and abrasive tumbling and one end of the barrel shaft was bored to permit a rinse stream to be directed into the barrel. This functioned well enough on the water and abrasive solution, but when oil and abrasive solution was used trouble developed and this was traced to a leaky valve on the

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SEYMOUR Bright Nickel Plate is offered to the plating industry only after careful study and test over a considerable period of time. It carries the full Seymour quality guarantee, and assures the user a deposit superior in many respects to standard nickel, plus a degree of ECONOMY that is NEWS!
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The deposit can be applied at widely varying current densities, and is unaffected by normal current interruptions. THROWING POWER IS EXCELLENT. Outstanding characteristics of the deposit: HIGH LUSTER – TARNISH RESISTANCE – GOOD ADHERENCE – DUCTILITY.
SEYMOUR

Practically Eliminates Coloring Costs!

A standard still or automatic equipment is ample, except that tanks should be rubber lined. Standard nickel anodes may be used, but special "Seycast" Nickel Anodes are recommended, particularly for low pH baths. The process is suitable for the following base metals and alloys: nickel silver, brass, cold rolled and tool steel, copper, and unbuffed copper on zinc die castings.

No specialist is required after our technical staff has supervised installation, but this staff will always be available if needed.

Write for prices and further details of a thoroughly tested and simple, economical bright nickel process.

THE SEYMOUR MANUFACTURING CO.
9 Franklin St., Seymour, Conn.
Also:
Nickel Silver, Phosphor Bronze

BRIGHT NICKEL PLATE

water line that left a small quantity of water to seep into the barrel and into the oil and abrasive solution.

Our suggestion as to the best cleaning procedure on parts that have come from an oil and abrasive operation is to slush them thoroughly in kerosene, Mineral Seal or High Flash Kerosene and then dry them by operating them in an oblique tilting type barrel with fibre meal, which being highly absorbent will thoroughly absorb the oil leaving only a very light protective film on the surface which will protect the parts from rust and corrosion until they are ready for the next operation and it is at this time that the alkaline cleaner and rinse is used. The slushing for cleaning in oil does not involve a waste or additional expense because the oil used for the cleaning operation may be later combined with the abrasive and utilized for the cutting down solution.

The second proposition which we have to discuss in this paper is also a cutting down operation where, instead of oil and an abrasive, water and an abrasive is used. If anything, there seems to be more complaints of pitting of steel parts in the water and abrasive solution operation than in the oil and abrasive operation. The great puzzle to most operators using the water and abrasive cutting down solution is their complaint that the trouble is intermittent, that is, that they can go along for a time without trouble of any kind and then suddenly pitting will develop, continue for a time, and then disappear. We have checked these troubles many times and have finally found that the greatest increase seems to occur in the early spring of the year or after streams that have remained frozen all winter following a thaw, release certain elements in the water that definitely have to do with this pitting.

Perhaps more chemical combinations have been experimented with in an effort to find a solution for this difficulty than for any other single phase of barrel finishing. Many operators have ascribed as a cause for this condition either excessive amounts of sulfur in the water or chlorine in city water where chlorination is practiced. It is doubtful whether this would be the cause and it would also be hard to believe that the sulfur content of any steel would be large enough to create such a condition. It is probably due to an excess aeration of the water with oxygen or perhaps gases set up by decomposition of matter lying inert through the winter and then released into the water in the spring thaws.

We have found, after years of experimenting, that there is one simple chemical element which when added to an abrasive and water solution will definitely prevent pitting of hardened steel parts at any season of the year and this is alum.

Now alum in chemistry is a term given to the crystallized double sulfates of the typical formula $M_2\,SO_4\,M^{iii}_2\,(SO_4)_3\,24H_2O$ where M is the sign of an alkali metal (potassium, radium, rubidium, caesium) silver or ammonium and M^{iii} denotes one of the trivalent metals, aluminum, chromium or ferric iron. All alums are soluble in water, have an astringent, acid, and sweetish taste and react acid to litmus.

Potash Alum is the commonest form but soda alum and ammonium alum are regularly manufactured and it is to the last named or Ammonium Alum Sulphate that we refer. The only difference between Potash Alum and Ammonium Alum being that in the latter, ammonium sulphate is substituted for potassium sulphate in the process of manufacture. The solubility of Ammonium Alum at various Centigrade temperatures may be of interest and is given as follows:

Temperature Degrees C	100 parts Water Dissolve
0	2.62
10	4.5
50	15.9
80	35.2
100	70.83

Two ounces of ammonium alum sulphate are sufficient per barrel load of material, or cutting down solution.

Now in cutting down operations we are often asked to suggest the proper proportion of either oil or water to be used with a given quantity of abrasive material and we would suggest the following:

Where eight to ten gallons of water or oil is used, add eight to ten pounds of abrasive material.

Where fifteen to twenty gallons of water or oil is used, add twelve to fourteen pounds of abrasive materials.

In cutting down operations on hardened steel parts, emery is generally used with oil, some operators using Turkish Emery while others use American Emery. It is perhaps the most popular grain size. For all practical purposes, we could never see the necessity for the additional expense involved in the use of the imported emery as the American variety functions equally as well. The selection of the abrasive medium is largely a matter of preference, keeping in mind the character of the material to be operated upon.

In respect to cutting down steel parts and especially hardened parts, the harder and faster cutting abrasives such as carborundum and aloxite may be used. On soft parts sharp sand or pumice, once ground rose tripoli, kieselguhr, polyrot or silica sand may be used to advantage. Generally speaking the proportion of abrasive to quantity of liquid used may be substantially as indicated in the preceding paragraphs.

The effect to be secured in a cutting down operation is that of obtaining a smooth even surface over the entire area of the parts. This is essential if further operations are to be successfully carried through. This, of course, embraces the removal of burrs and drags from the edges of the parts, but in some cases preliminary wheel operations are required and in such cases we would again caution against the use of too coarse a grain of abrasive or set up wheel, because wheel marks or cuts require correspondingly longer operation cycles in cutting down and care in removing such parts of articles has much to do with the later speeding up of production which in turn is directly reflected in the final cost figures.

In these cutting down operations, whether oil or water is used as the solution base for carrying the abrasive in suspension, the best results are obtained by the use of a weight adding as well as a cushioning medium, and for this purpose there is no medium that functions quite so well as soft annealed balls or preferably soft annealed burnishing forms such as diagonals, cones, balcones, finbals or diamonstels. The formed pieces carry the abrasive under pressure into grooves and angles where round balls, due to their sphericity cannot go, and the same principles apply in the finishing of every part of the surface as in a burnishing operation. The same basis proportion of two parts of burnishing material to one part of parts being finished also applies. In cutting down operations the barrel should be between one-half and two-thirds full or just over the center of the axis of the barrel so that the downward flow of the mass will be as long as possible.

Progressing now from the cutting down or barrel grinding operation on hardened steel parts; in some cases a cutting down operation should be employed on parts prior to hardening and then another operation after hard-

ening, especially so if there is any considerable quantity of scale on the surface. An acid pickle is seldom, if ever, necessary on parts blanked and formed from strip material.

It would be interesting to know just how many operators have endeavored to obtain high lustrous finishes on hardened steel parts by the use of a conventional hardened and polished mass of steel burnishing materials operated with soapy water as a lubricant and in maple lined barrels irrespective of type.

If water and abrasive is used in the cutting down operation on hardened steel parts, the same barrel may also be used for the polishing operation, or in other words, one barrel may serve for both operations. Once the parts have been brought to the necessary smoothness, the abrasive solution is washed from the barrel and when it is certain that the inner surfaces of the barrel and the parts are thoroughly clean and the abrasive all rinsed out, the parts are separated from the soft annealed burnishing materials and replaced in the barrel, this time with a like quantity of hardened and polished steel burnishing material and another charge of clean water. For each gallon of water in the barrel add one and one-half pounds of Vienna Lime. We do not attempt to lay down any time schedule for this final polishing operation on hardened parts for so much depends on the character of the finish obtained in the previous cutting down or smoothing operation. Anywhere from five to eighteen hours may be required before the final and satisfactory finish is obtained. The Vienna Lime run is generally intended to remove from .00015-in. to .00025-in. of surface and on properly hardened parts it is not difficult to obtain burnished finishes comparable to that on the average hardened steel burnishing materials. The only effect this lime operation would have on the hardened burnishing materials would be to gradually reduce them in size with perhaps a slight alteration in the contour of the formed burnishing pieces. While, as stated, one barrel may be used for both the above operations when water and abrasive is used, this is not true when oil and abrasive is used, and in this case two barrels should be used, first the barrel for oil and abrasive and soft burnishing materials and secondly another unlined barrel with the cut down parts, water and Vienna Lime and hardened burnishing materials for the final burnished finish on the hardened parts. These barrels should be preferably of the high and narrow Abbott type.

When the Vienna Lime operation has been completed, the solution should be washed from the barrel with warm water if possible and when the water runs clear, another charge of water should be added to the mass along with about three ounces of curd burnishing soap and the barrel operated for about ten minutes simply as a washing operation after which the parts should be removed from the barrel and quickly dried in fibre meal to prevent any chance of staining.

If a final buffed or more highly lustrous finish is desired, the parts may be taken from the fibre meal drying operation, and this operation may be done in a tray or oblique tilting type barrel with hard maple barrel shell. The parts are then placed in another oblique tilting type barrel with maple barrel shell and buffed with leather scrap (preferably sheep or calf skin) or macerated rands of leather. This operation requires only a very short run, and is the final operation in the bright finishing of hardened steel parts by the barrel process.

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From day to day, many interesting letters are received from readers of PRODUCTS FINISHING. Some request technical information — others are endeavoring to locate sources of supply for materials and equipment — many tell of their great interest in the constructive, helpful articles contained in the various issues.

Typical of the comments contained in letters received in the last few days are these:

"Allow me to congratulate you on your fine publication, PRODUCTS FINISHING, and on the excellent series of articles on barrel finishing of metal products."

S. R. Norman, Sales Representative
Magnus Chemical Company
Garwood, New Jersey

"Your journal is very much appreciated by those who are familiar with that type of work in our organization and many splendid articles are listed therein."

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"We are regular readers of your monthly publication, PRODUCTS FINISHING, which we find very constructive and educational."

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Universal Metal Products Co.
Los Angeles, California

"We have just read the very interesting article by Ezra A. Blount titled 'The Application of Electro-plating Practice to Porcelain Enameling' which appeared in PRODUCTS FINISHING. We would like to write Mr. Blount and would appreciate your sending us his address."

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Comments from our readers are always appreciated. Let us hear from you.

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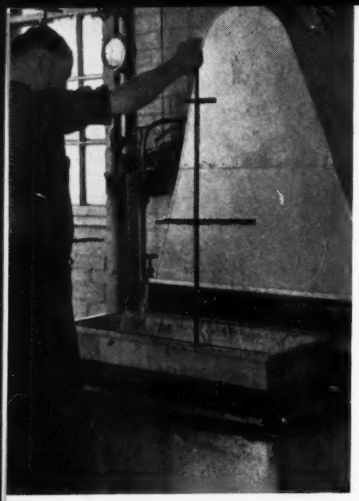


PRACTICAL APPLICATIONS of MODERN EQUIPMENT

Buffing and Polishing of Ornamental Architectural Fixtures

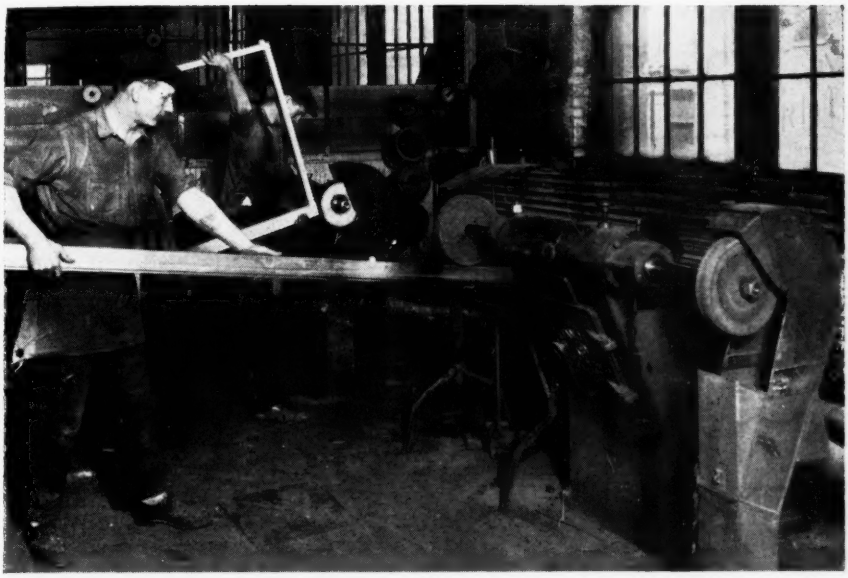
The polishing of ornamental metal fixtures requires a machine with the facilities for changing the spindle speed in order to obtain the correct peripheral speed on the wheels. The material used in the manufacture of such ornamental fixtures is dependent upon its application or the desires of the purchaser. Such materials as bronze, brass, aluminum, nickel, chrome and stainless steel are used quite extensively in the manufacture of ornamental architectural fixtures.

The finishes on these articles are quite varied and the selection of the correct grain emery for the emery faced cloth wheels is determined by the finish required. A solid felt wheel on which a buffing compound is used is required in some instances for coloring. Small recessed work is buffed or polished by using tampico wheels.

Buffing or polishing wheels used for ornamental metal work vary in sizes from 4 in. to 10 in. in diameter depending upon the material, design of the work and the finish required. The buffing and polishing machine on which the work is done must provide the necessary spindle speed changes to obtain the correct peripheral speed on the wheels.

While most ornamental work can be handled by hand, some of the larger pieces are mounted on a movable jack, and the work is polished as shown in the illustration herewith. The "Proper Speed" Buffing and Polishing Machine manufactured by The Standard Electrical Tool Co., 1941 W. 8th St., Cincinnati, Ohio, is well adapted for accomplishing satisfactory results in an economical manner on production of this kind.

The spindle on the "Proper Speed" overhangs the front of the base to permit the handling of bulky work without interference of the base. A ball bearing motor is mounted inside the base. Both the motor and buffing spindles are fitted with a three-groove sheave, the power being transmitted to the buffing spindles through three V-Belts. The speed of the spindle is determined by the diameter of the



Large ornamental architectural workpieces are easily polished when mounted on the movable jack of this "Proper Speed" Buffing and Polishing Machine.

sheave on the motor shaft. This sheave is quickly removable when another diameter sheave is to be mounted for a spindle speed change.

The tension on the belts is obtained by adjusting the motor bedplate. The motor bedplate is hinged and fitted with a hand-adjusting screw for raising and lowering the motor.

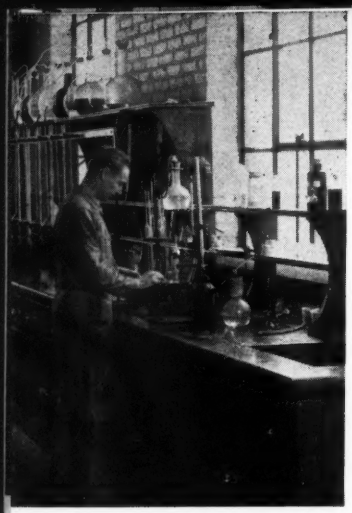
The nickel steel spindle is heavily constructed and mounted in four heavy-duty ball bearings. A hand brake for quickly stopping the spindle is also included, thus eliminating lost time when wheel changes are required. A shaft-locking device is provided for use in changing wheels. The wheel nuts are made of hard bronze to protect the threads on the spindle from undue wear due to frequent wheel changes.

"Pre-Finished American Bonded Metals". This is the title of a beautiful 32-page booklet which is now being issued by the American Nickeloid Company, Peru, Illinois. It is stated by this company that this booklet is the most complete and concise reference on modern design that has ever been released by a metal manufacturer. Included in this booklet is a vast summary of information compiled in reference tabular form. Hundreds of new items which make use of bright metals for trim or basic material are illustrated.

Pre-finished sheet stock with colored coatings—said to be the newest development in the pre-finished metal industry—is also covered at quite some length. The booklet is a treatise on pre-finished metals—what they are, how they are used, and how they are available.

A few of the items covered in quite some detail are as follows: Coiled Strip for Continuous Feeding, Bright Metals in Color, Round Edge Flat Wire, and Metal-Bord.

Copies of "Pre-Finished American Bonded Metals" will be sent to any finishing department executive who will send his request on his firm letterhead to the American Nickeloid Company, Peru, Illinois.



the FINISHING FORUM

Question: What solution or process can we use to produce a matte finish on sheet aluminum?

Answer: The simplest method of producing a matte finish on sheet aluminum is an immersion treatment. Simply dip the aluminum parts for one to two minutes in a solution of 2.5 oz. per gal. of sodium hydroxide, and 5.9 oz. per gal. of trisodium phosphate. This solution should be operated at 200 degrees F. and no electric current should be used. After the parts are treated they should be dipped quickly in cold water and then in hot water. If the drying is then accelerated by a compressed air blast, staining will be prevented.

The finish obtained by this method will vary with the composition of the aluminum parts and the composition of the solution. If the suggested formula does not produce a satisfactory surface, the amount of sodium hydroxide can be varied and some experiments made to determine the proper formula. The solution suggested is, however, a well-balanced solution and should work well with most commercial aluminum sheets.

Question: The monel metal pickling frames used in our enamel shop pickle room are becoming coated with a red deposit. We assume that this deposit is copper and we would like to know how to remove it to prevent contamination of our pickling acid.

Answer: The red deposit is no doubt copper produced by such corrosion of the monel frames as may occur. The best method to use in removing this scum or deposit is to sand-blast the frames periodically. This red deposit will not form very rapidly nor will it contaminate the pickling acid to any great extent. The pickling acid is usually changed too often for it to become contaminated with copper.

Comb-Type Racks For Stacking Finished Work On Edge

By John E. Hyler

IN THE finishing and drying of flat parts, it is always a point in good practice to stack the freshly finished workpieces in such a manner that

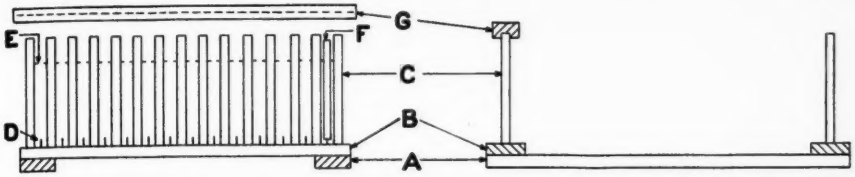


Illustration showing comb-type rack for stacking finished workpieces on edge.

they will not be in contact with anything or at least in contact only to the smallest possible extent. It is also necessary that there is full and free circulation of air around the workpieces until the finish coating has thoroughly dried. Work can be dried in this manner when the rack shown in the drawing herewith is used. The rack somewhat resembles a pair of giant, inverted combs, between the teeth of which the workpieces are placed.

The rack consists primarily of two pieces, designated as A, which are laid parallel to form a base. Across the ends of the pieces A are fastened two pieces B, which become the support for the pieces of dowels C. A piece B is bored with a series of holes to receive the dowels C. The dowels are a consistent distance apart to permit assembling as shown and to accommodate any standard thickness of workpieces. The dowels C are made somewhat longer than the widest piece of work that the rack is planned to accommodate.

Midway between the dowels a series of small points made of nails from which the heads have been cut is located. The points are set into small drilled holes into which they will fit snugly and at the same time protrude one-half inch or more. Thus, the bottom edge of each workpiece such as F, when set into place as shown, will rest only on two of the small points.

At a point some distance from the top of the dowels, small points such as E are arranged in opposite pairs as indicated. The points E are set into the dowels C and protrude from each side. This arrangement can be made by cross drilling the dowels C to snugly receive a piece of wire that is pointed on both ends, and which is long enough to protrude slightly on each side of the dowels C. Workpieces similar to F, located on a pair of points D at the base, will settle either to the right or to the left above and come into contact with one or more of the points E. The work, therefore, cannot make contact anywhere on these very small points.

Racks of this type may be stacked several high if desired, thus making use of available space for stacking the finished work. To this end, it is necessary to provide a bearing strip

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on the top of one rack to receive another. A piece G is grooved on its under side as indicated so the groove will snugly fit the dowels C. Two pieces similar to G, one placed over each series of dowels, will provide a natural bearing upon which a second rack, exactly like the one shown, can be set for filling. Procedure can be continued until the racks are stacked several high.

Udylite Introduces Bright Nickel Plating Process

By E. R. Sterling

A BRIGHT nickel plating solution that is stable, easily controlled and has excellent throwing power has recently been placed on the market by The Udylite Company, 1651 E. Grand Blvd., Detroit, Michigan. No ingredients of the Udylite solution will decompose to produce undesirable results. Where the sequence of the plating cycle requires nickel over copper prior to chromium, the Udylite bright nickel can be plated directly over the copper flash with no intermediate operations. The copper deposit, however, must be smooth. After nickel plating, the work can be placed directly into the chromium plating bath with no intermediate operations.

The proper lustre required for a nickel coating that is essential for successful chromium plating is obtained from the bright nickel bath. The Udylite bright nickel plating process is especially adaptable to die castings, and brass and steel parts of irregular shape. Because of the brightness of the nickel, no nickel is lost by buffing. Udylite engineers state that chromium has a maximum of throwing power over the bright nickel, thus making for simpler racks and less rack maintenance.

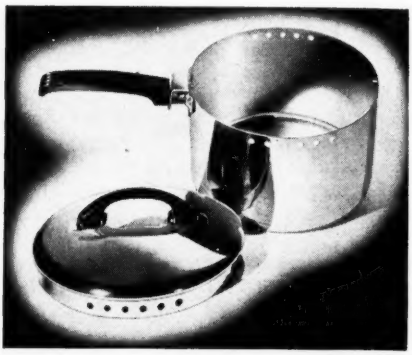

Fig. 2—Good throwing power is evidenced with the Udylite bright nickel plating solution in processing this saucepan 8 in. in diameter and 5 in. deep which is flashed with copper, then bright nickel plated. The solution deposits a bright, even coating on the entire inner surface which is not buffed prior to chromium plating. The base metal is cold rolled steel finished with No. 200 emery.

The nickel coating obtained by the Udylite process is smooth and ductile as well as bright. It adheres well, and does not flake, chip or peel. No activation is required prior to chromium plating. The operating efficiency of the process has been determined to be between 98 and 99 per cent. Among the features of the bright nickel plating process is the ease of control. Operators of efficient plants will have no dif-

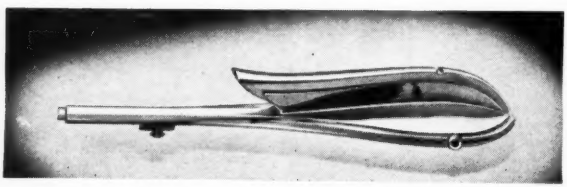

Fig. 1—The radiator ornament shown in the illustration herewith has been buffed, copper plated, bright nickel plated, light nickel wiped, and then chromium plated.

ficulty in producing desirable results with the Udylite bright nickel plating process.

"Kompak Air Filters Bulletin No. K-120". This is the title of an 8-page bulletin which is now being issued by Independent Air Filter Company, Inc., 228 N. LaSalle St., Chicago, Ill., in which Kompak Model C Air Filter is described. The Kompak Air Drying Filter combines the principles of large area, low velocity and renewable medium in one unit. The Kompak Air Filter is a continuous hinge holder, designed to permit a maximum quantity of filter medium to be exposed in a given area. The individual Kompak cell accommodates 18 lineal ft. or 30 sq. ft. of filter medium in less than 2 sq. ft. of face area—a ratio of 15 to 1. Slightly more than 20 sq. ft. of the total 30 sq. ft. are devoted to filter area. This large filtration area in each cell permits low velocity through the filter medium.

The standard material furnished with and recommended for use in the "Kompak" holder is "Kompak" Filterdown.

Kompak frames are constructed of heavy structural steel angles riveted together to form ladders one cell wide by as many cells high as the individual unit may require. When the vertical ladders are bolted together, a rigid frame is formed.

The individual Kompak cell measures 14 in. by 20 in. and is constructed of high grade steel, thoroughly rust proofed. Heavy solid brass rivets guarantee a durable joint in the continuous hinge design.

Copy of Bulletin No. K-120 free upon request.

Sheffler-Gross Bulletin 100. Sheffler-Gross Company, Inc., Drexel Bldg., Philadelphia, Pa., manufacturer of temperature control apparatus, is now offering Bulletin 100 in which Duoflo Duplex Strainers for industrial oil burning equipment are described. The Duoflo Suction Strainer is made of cast iron and has two perforated baskets held in place by the covers. This duplex construction allows one strainer to be cleaned while the other is in operation. In addition to the description of the Duoflo Suction Strainer, illustrations and diagrams are included. A Duoflo Discharge Strainer is also illustrated and described. Specification tables for both the suction strainers and the discharge strainers are listed on the fourth page of the bulletin. Copy free upon request.

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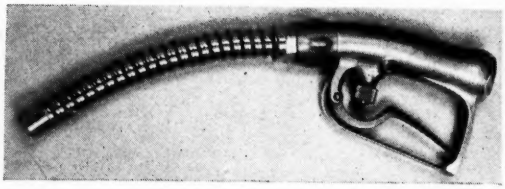
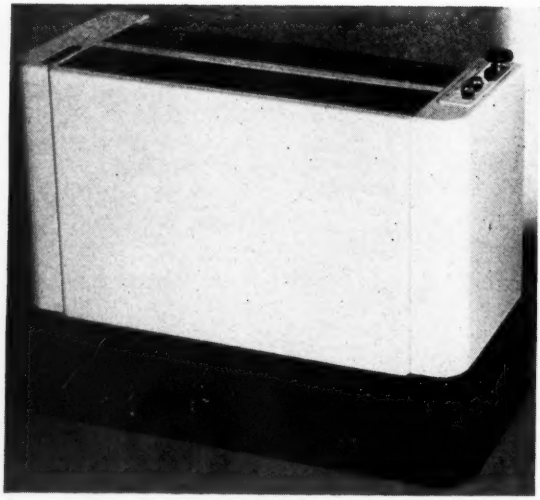
FINISHES THAT AID IN APPEARANCE AND UTILITY

This streamlined aluminum alloy gasoline hose nozzle is designed and constructed to withstand hard usage and to fit in with modern gasoline station appearance. The body is finished in Indurite to resist abrasion, weathering, perspiration, and grease and gasoline stains. The flexible metallic spout and other accessories are finished in polished chromium.



—Photo Courtesy Scovill Manufacturing Company



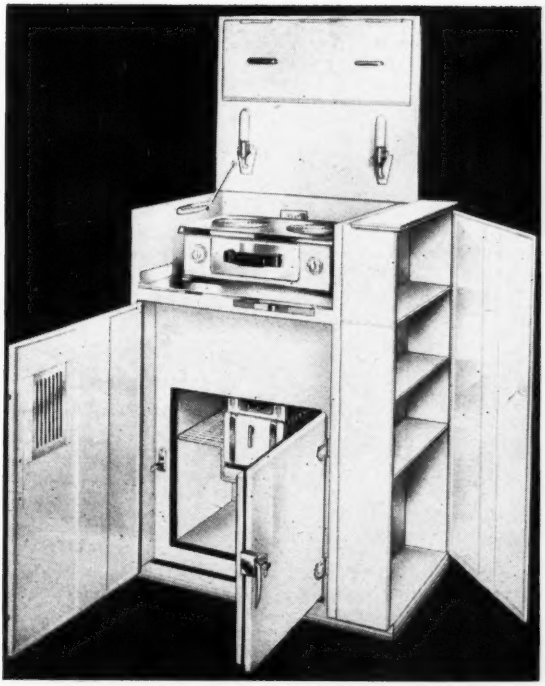
This ivory and black "Chatelaine" air-conditioning unit, product of Standard Air-Conditioning, Inc., is built of steel stampings. The stampings are degreased and Bonderized and then covered with a spray coat of M & W Durad neutral baking primer, which is baked one hour at 350 degrees F. The cabinet is then given a spray coat of eggshell baking enamel, which is baked at 300 degrees F. for one hour. The apron is sprayed with Durad gloss black baking enamel which is also baked at 300 degrees for one hour.

—Photo Courtesy Maas & Waldstein Company

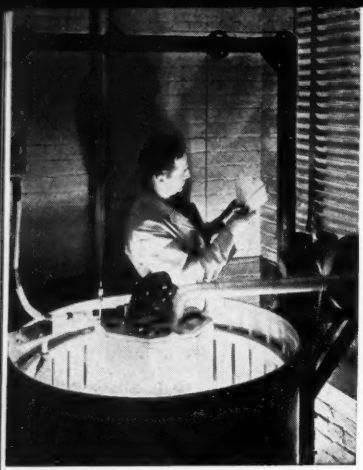
—Photo Courtesy International Business Machines Corporation

The attractive, durable finish of the International Electric Writing Machine is an example of modernized finish technic. Upon the base, which is a die casting, a coat of rubber consisting of a heavy japan is baked at 350 degrees to 400 degrees for three hours. This is followed by one coat of morocco, baked in a slow oven at 125 degrees until completely broken up, then stepped up to 350 degrees for one hour. The finishes are sprayed on with utmost care and the base is covered a second time over with the morocco finish.

Indicative of the trend in hotel and apartment equipment is this Electric Invisible Kitchen. All working surfaces are of stainless steel and the standard models are finished in ebony and stainless steel outside with ivory inside throughout, including the porcelain - lined refrigerator.



—Photo Courtesy Electric Invisible Kitchen Co.



NEWS OF THE INDUSTRY

Charles S. Pearce Appointed Secretary of Porcelain Enamel Institute

According to a recent announcement, Mr. Charles S. Pearce has been appointed to the position of secretary of the Porcelain Enamel Institute, Inc., 612 N. Michigan Ave., Chicago, Illinois. Mr. Pearce started his industrial career with the Weirton Steel Company at Weirton, West Virginia, in 1918. He left there in 1920 to attend college, graduating from Ohio State University in 1924. During his college years, Mr. Pearce was employed for a short time with the Foundries Division of the Jones & Laughlin Steel Corporation at Pittsburgh, Pennsylvania.

Immediately after leaving Ohio State he entered the employ of the Tennessee Furniture Corporation, Chattanooga Tennessee. This concern was at that time producing some of the first all-porcelain enameled refrigerators and specializing in the development of the one-piece porcelain enameled liner.

In 1926, Mr. Pearce joined the Budgetary control Division of the Frigidaire Corporation at Dayton, Ohio. In the next four years he held various office and factory positions with that company. In 1930 he was made head of the Porcelain Enameling Department, at that time the largest wet process enameling plant in the United States.

Mr. Pearce left this position early in 1935 to head up the enameling operations at the Davidson Enamel Company at Clyde, Ohio. In the fall of 1935 he joined the Farm Security Administration as Assistant Director of Personnel, which position he leaves to assume his new duties.

In selecting Mr. Pearce as secretary, the officers point to his wide range of experience in the manufacture of porcelain enamel as eminently fitting him to serve the industry through the facilities of the Porcelain Enamel Institute.

Hammond Machinery Builders Establish Permanent Eastern Outlet

Hammond Machinery Builders, Kalamazoo, Mich., has found it necessary to move their eastern branch into larger quarters to take care of the increasing demand for Hammond products in the East.

The new location is at 71 West 23rd St., New York City (telephone GRamercy 5-6619) and provides more display space for their many popular machines, including several introduced within the past year.

Mr. W. J. Holtmeier, eastern manager, has plans underway to display in the New York office several models of polishing lathes and grinders for inspection. He has been with the Hammond Machinery Builders for ten years and is either directly or through dealers and other representatives serving all the eastern states from North Carolina and Virginia north to Maine.

Despatch Oven Company Announces Election of Board of Directors

On February 1, at the annual meeting of the board of directors of the Despatch Oven Company, 622 Ninth St., S. E., Minneapolis, Minn., the following officers were re-elected: president, A. E. Grapp; vice-president and general manager, H. L. Grapp; vice-president and production manager, C. P. Doherty; vice-president and chief engineer, G. C. Keyes; and secretary and sales manager, F. H. Faber.

The Despatch Oven Company, manufacturers of industrial ovens, dryers and furnaces as well as laboratory ovens and cabinets, and bakery ovens, reports that the most outstanding progress was made last year of any time during the history of the company.

W. E. Wechter to Head Worthington Oil and Gas Atlantic Division

The appointment of Mr. W. E. Wechter as manager of Oil and Gas Engine Sales, Atlantic Division, has been announced by Worthington Pump and Machinery Corp., Worthington Ave., Harrison, N. J. Mr. Wechter succeeds Mr. R. L. Howes who recently resigned.

In his new duties, Mr. Wechter will supervise oil and gas engine sales in the Atlantic seaboard territory, in which are the Worthington offices at Boston, New York, Philadelphia, Washington and Atlanta.

Since his graduation from Purdue University in 1923, Mr. Wechter has been connected with the Worthington organization, having held successive the positions of salesman in Atlanta territory, Atlanta District Sales Manager, Detroit District Sales Manager, and Assistant Manager of the Oil and Gas Engine Division at Harrison, New Jersey. He will now make his headquarters at the Worthington office, 2 Park Avenue, New York City.

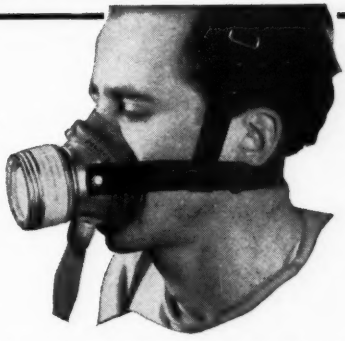
Canadian Cutler-Hammer Limited Organized

Cutler-Hammer, Inc., 12th and St. Paul Ave., Milwaukee, Wis., has announced that a company to be known as Canadian Cutler-Hammer Limited has been organized for the purpose of manufacturing Cutler-Hammer motor and generator control products for the Canadian market. The company will be a subsidiary of the Amalgamated Electric Corporation Limited which will provide the manufacturing facilities.

NEW! DC-4100 *Double Cartridge*
CHEMICAL RESPIRATOR

For Acid and Organic Fumes and Vapors; also Paint Spraying. Two chemical cartridges give greater protection for twice the period. Cartridges changed less often. Light, comfortable, easy breathing. Long service, at low cost.

NEW! R-151 Chemical Respirator



For same hazards as above. Has single cartridge with additional outer filter to prevent particles from clogging cartridge. Valuable where such clogging danger exists, as in paint spraying. Economical, efficient, light, comfortable.

● *Try these respirators. Write us for details and prices.*

Pulmosan Safety Equip. Corp.
Dept. PF. 176 Johnson St., Brooklyn, N. Y.

The new company's headquarters address will be 384 Pape Ave., Toronto 6, Canada.

Cutler-Hammer, Inc., wishes to express assurance to its customers that the products so manufactured will retain the same high quality standards for which Cutler-Hammer is well known throughout the industry.

The Northern Electric Company of Canada, for many years the principal distributor for Cutler-Hammer in Canada, will act as the distributor for the new Canadian company. This new arrangement marks an important stride in the improvement of service and facilities for the many Cutler-Hammer customers in Canada.

Porcelain Enamel Association Formed

Mr. L. J. Clay, of the Public Service Supply Company, Inc., Cleveland, Ohio, was announced as president of the newly formed Porcelain Enamel Sales Associates. W. H. Chandler, of the Chandler Chemical Company, also of Cleveland, was elected secretary of the association.

The purpose of the association is to extend the use of porcelain enamel into the basic industries and is composed of the following companies: O. Smith Johannsen Company, New York City; Peerless Equipment Company, Chicago, Ill.; Chandler Chemical Company, Cleveland; Hodson-Miller Corporation, Detroit, Mich.; and the Public Service Supply Company, Inc., Cleveland.

Martindale Electric Company Purchases Hergi Mfg. Company

The Martindale Electric Company, Box 617, Edgewater Branch, Cleveland, Ohio, has recently announced the purchase of The Hergi Mfg. Co., Brideport, Conn., and has moved the factory to Cleveland where the manufacture of the same extensive line of motor driven flexible shaft equipment, and carbon, alloy, and high-speed rotary files, rasps and burrs will be continued.

J. E. MacMahon Appointed General Sales Manager of Graton & Knight Company

J. E. MacMahon, formerly assistant sales manager, has been appointed general sales manager of Graton & Knight Company, Worcester, Mass., to succeed Mr. C. O. Drayton, who recently resigned.

Mr. MacMahon has had many years' experience with the company, including work in the factory, engineering department, and as a sales manager in a Southern territory. In recent years, he has been employed in an executive capacity, in the sales promotion and advertising departments as well as the sales department.

New Wrinkle, Inc. Obtains Wrinkle Finish Patents

New Wrinkle, Inc., Mutual Home Bldg., Dayton, Ohio, has bought all of the wrinkle finish patents owned and controlled by The Chadeloid Chemical Company, The Kay & Ess Chemical Corporation and The Kay & Ess Company. It has taken over all the licenses and rights of these corporations and all litigation has been settled.

The policy of New Wrinkle, Inc., is to promote the widest possible use of these patents. The numerous pending patent applications and the new developments that are expected to be patented are offered to responsible members of the paint and varnish industry, a very simple license at a new low royalty rate. All previous patent licenses for the use of these patents will be cancelled by the licensees signing the new license agreement. The Kay & Ess Company and The Chadeloid Chemical Company has signed the same license which is being offered to others.

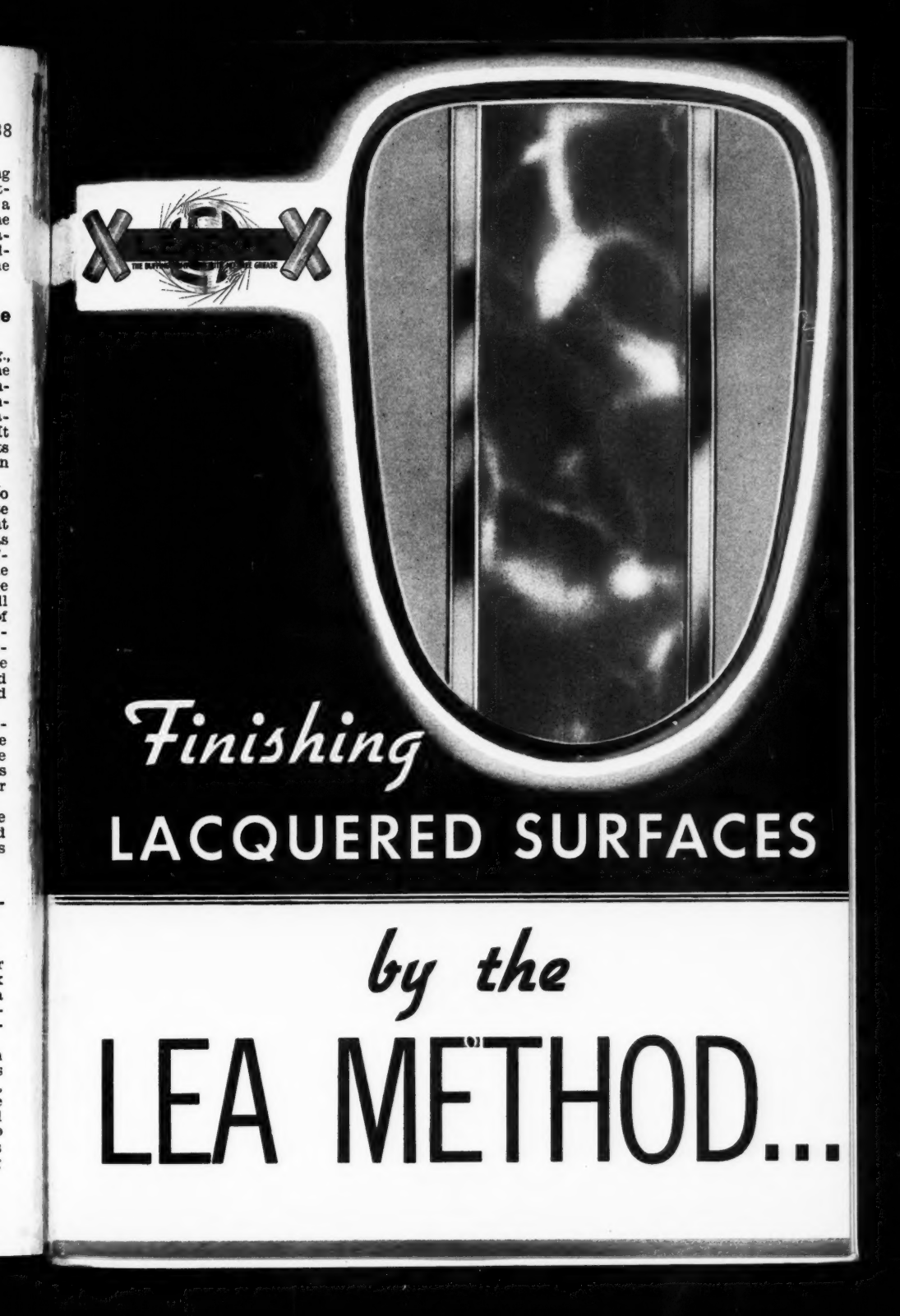
As a matter of policy, it is the intention of New Wrinkle, Inc., to promote the sale of wrinkle finishes by suitable publicity and to add further inventions and patents by additional research for the benefit of the industry.

Licenses are open to all responsible manufacturers in the industry engaged in this field. A number of such licenses are now being signed.

Glen H. Treslar Appointed Assistant Sales Manager of Black & Decker

The appointment of Glen H. Treslar as assistant sales manager of The Black & Decker Mfg. Co., 720 Pennsylvania Ave., Towson, Md., has just been announced by Mr. S. Duncan Black, president of the company.

Mr. Treslar has been associated with the organization for more than 15 years in the capacities of territorial salesman, territorial branch manager, and more recently as supervisor of the Cleveland and Detroit areas. Mr. Treslar is to have his headquarters at the company's home office at Towson, Md., assisting Mr. Robert D. Black, sales manager.


Finishing
LACQUERED SURFACES
by the
LEA METHOD...

Compacts, Rouge and Lipstick Cases

These articles by themselves comprise an important group and the finishing of lacquered surfaces is a problem in itself. Many of the leading manufacturers of articles such as illustrated use the LEA Method for this important step. They find that it not only produces an excellent quality of finish but cuts costs over previously used methods. LEAROK, the fast-working composition selected for this work, has no "free" grease. It's clean and because of this the workman can control the finish better. He can see what's going on. If there are ornamentations, it doesn't pack up. Cleaning operations and cleaning time are minimized.

The LEA Method aims to produce desired finishes with fewer operations. The fact that hundreds of concerns now use it may interest you in considering it for producing the finish on your articles.

THE LEA MANUFACTURING CO.

WATERBURY, CONNECTICUT

Canadian Agents: LEA PRODUCTS CO.

686 Notre Dame Street, West **Montreal, Canada**

British Industries Fair to Exhibit New Metal-Testing Instrument

An instrument which will enable engineers to test the hardness and wearing properties of various metals and also the effect of such wear on different grades of oils will be exhibited for the first time at the Birmingham section of the 1938 British Industries Fair, to be held in London February 21 to March 4. This instrument will be one of the many features by which this special exposition of the British Empire's heavy industry will attempt to mark a milestone in engineering progress.

With the newly developed metal-testing instrument, the engineer can find out exactly what happens to crankcase bearings in an automobile when an engine starts and stops. He can also test various alloys under continuous load or when subjected to the strain of intermittent stopping and starting.

General Abrasive Company Appoints General Manager

Mr. Alan V. Parker, president, General Abrasive Company, Inc., Niagara Falls, N. Y., was recently elected general manager of the company. It has also been announced that Mr. Harold A. Richmond will continue his connection as chairman of the Board of Directors and treasurer.

The Revolite Corporation Name Changed to Industrial Tape Corporation

The Revolite Corporation, New Brunswick, N. J., announces that a change of name will take effect. The Revolite Corporation will be known as Industrial Tape Corporation, New Brunswick, N. J.

The products of the Industrial Tape Corporation will be identical as heretofore — Permacel, Jonflex, Electape, and Utilitape.

South Bend Air Products, Inc. Takes Over Bendix Industrial Fan Division

South Bend Air Products, Inc., South Bend, Ind., recently purchased the ventilating equipment business formerly conducted by the Industrial Fan Division of the Bendix Products Corporation.

The president and general manager of the new company is Marshall A. Smith, Jr., formerly in charge of sales and engineering of the Bendix Industrial Fan Division. Before coming with the Bendix Aviation Corporation in 1929, Mr. Smith was chief of the aircraft propeller unit of the Engineering Division, U. S. Army Air Corp. at Wright Field, Dayton, Ohio.

Manning, Maxwell & Moore Assigns Territories To New Salesmen

Manning, Maxwell & Moore, Inc., Bridgeport, Conn., makers of valves, gauges, safety valves, thermometers and control instruments, announce the assignment of nine new general field salesmen to territories.

"This increase in our sales force is made to provide better service for our customers and more frequent calls on our prospects," states Mr. W. P. Bradbury, general sales manager.

New territories have been created and salesmen with headquarters as follows to serve them: Charlotte, N. C., Paul Hayden; Jacksonville, Fla., W. H. Kissam; New Orleans, La., R. F. Heath; Minneapolis, Minn., K. W Johansson; Columbus, Ohio, W. S. Adams.

The following territories where an established office is strengthened by salesmen are as follows: New York City, V. W. Farris; Philadelphia, H. H. Jones; Chicago, H. B. Stallings; Tulsa, C. W. Velie.

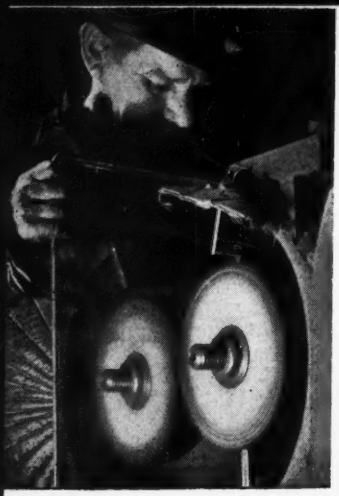
Two new district sales managers are also announced as a part of this sales force expansion. R. W. Neel, who has represented Manning, Maxwell & Moore for a number of years, is now in charge of the newly created Southeastern district with headquarters in Atlanta. Malcolm Black has been made manager of the Southwestern district with headquarters in Tulsa.

Murray B. Wilson Named Armco Manager

Murray B. Wilson, associated with The American Rolling Mill Company, Middletown, Ohio, since 1923, has been named manager of the New York sales district of this company, according to H. M. Richards, manager of the sheet and strip sales division.

Following his graduation from Miami University, Oxford, Ohio, Mr. Wilson started as a mill worker at Armco's Middletown plant. He later was assigned to the home office sales division. Since 1927, he has been attached to the Detroit sales district office of the company.

He succeeds Cliff Spear, who was forced to curtail his activities because of continued ill health.



NEW
Plant Equipment & Materials

Hydroflo Metal Parts Washer

A metal parts washer, to be known as "Hydroflo", has recently been placed on the market by the International Conveyor & Washer Corp., 640 E. Fort St., Detroit, Michigan. In addition to many mechanical improvements, this washer is designed to give an improved appearance to this type of equipment. All extruding parts such as pipes, motors, pumps, and structural equipment are hidden from view and only clean, smooth outside surfaces proportioned in accord with the best thought in modern machine design present themselves.

Although arrangements are made to vary all specifications in order to accommodate various washing requirements, a standard model has been designed along the "through-flow" principle. In a range of sizes, these models may be obtained with the flight-bar power conveyor, the wire mesh belt, or the simple "push-type" rollers. These washers are available in one, two or three stages as desired.

Hydroflo Metal Parts Washer

In the Hydroflo washer particular attention has been given to all mechanical features. A special study has been given to the flow of the cleaning solution both on the pressure side of the pump and in the tank. The pump is arranged to give the most direct flow to the nozzles and all ells and tees have extra large radii in order to keep fluid friction at a minimum. Special corrosion resistant nozzles are used which positively

control the impingement of solution upon the surfaces to be cleaned. These are specially arranged with each machine and are said to give a maximum of cleaning efficiency at all times.

After passing over the work, the solution is shunted by special baffles into a settling tank where the flow is arrested in such a way that the particles of dirt settle to the bottom.

The solution then "overflows" into a circuitous passage leading to the pump. As a further precaution to remove all the dirt particles, two screens are placed immediately before the pump intake. These screens are removable for cleaning. Heat is obtained either by steam injection or by coils as to the specifications of the particular installation.

A number of special convenience features have been incorporated in the Hydroflo. These features include the availability of all tanks for cleaning and the accessibility of the working parts. Large dial temperature gages are mounted on the side to show the temperature of the solution at all times.

Shut-off valves and large overflow pipes are also included. Special attention has been given to baffling the solution to keep it from spraying out at the end of the unit. Hydroflo washers are available in a range of sizes to accommodate the cleaning of a great variety of small metal parts.

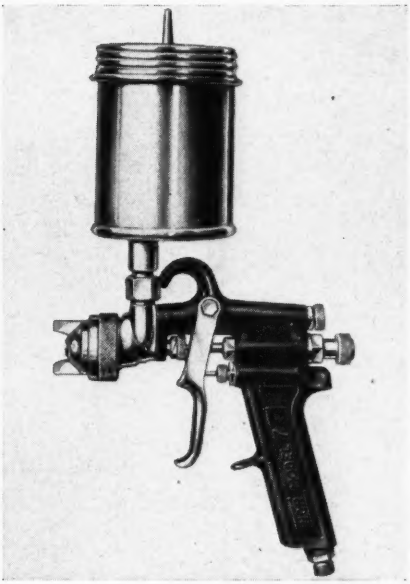
E. Reed Burns Free Work Caps

The E. Reed Burns Mfg. Corp., 31 Jackson St., Brooklyn, N. Y., will send without obligation a work cap to every polishing or buffing workman who will send his request on his firm letterhead. Any foreman or superintendent sending in a request should indicate the number of employees in his polishing or buffing department. There is no obligation connected with this offer.

Binks Thor 7-F Top Feed Spray Gun

Binks Manufacturing Company, 3114 Carroll Ave., Chicago, Ill., has placed on the market a top feed spray gun to be known as the "Thor 7-F". This gun is said to be designed for laboratory use to duplicate gravity feed conditions, and for materials of such a nature that they cannot be sprayed with the ordinary syphon spray gun.

The Thor 7-F is made with either straight top feed or angle top feed cup which has a capacity of one pint. The purpose of the angle top feed is to enable the operator to tip the gun almost at right angles without any danger of spilling the material in the top feed cup.



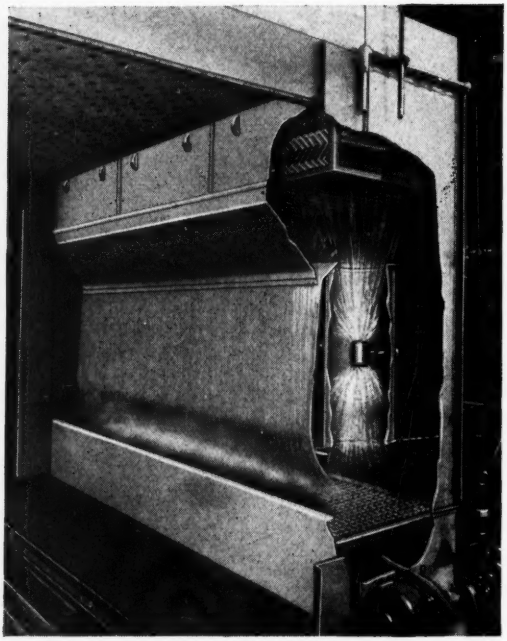
Binks Thor 7-F Top Feed Spray Gun

Newcomb-David Centrifugal Wet Cleaning Spray Booth

A Centrifugal Wet Cleaning Spray Booth for use in the spray application of prime, surfacer, lacquer or synthetic enamels has been placed on the market by Newcomb-David Company, Inc., 5741 Russell St., Detroit, Michigan. The operation of the Newcomb-David booth has been perfected to such an extent that after the cleansing process, the exhaust air is free from paint pigments. A water curtain principle permits the reclaiming of paint without the disadvantage of paint pigment accumulating on the walls and back of booth.

A suction fan is provided to carry the paint laden air away from the operator. Before passing through the fan, the fume laden air is passed through a torrential water spray, then through moisture eliminating plates, and then to the fan.

Paint which does not come in contact with workpieces is carried into a sludge tank at the base of the spray booth unit and after it passes through the cleaning



Cut-away illustration showing the operation of the Newcomb-David Centrifugal Wet Cleaning Spray Booth

process it can be easily removed and reclaimed.

The illustration herewith shows the operating principle of the Newcomb-David Centrifugal Wet Cleaning Spray Booth. The air which carries the excess paint and fumes is drawn by a suction fan, located above the booth, through the water spray and then through moisture eliminating plates. The air is cleaned before reaching the fan and exhaust stack. The spray nozzles have been so designed so that they will not clog.

One of the most important features of this booth is the water curtain flowing over the inclined plate, located directly behind the object being sprayed. A water deflecting plate directly above the water curtain directs the water which enters the eliminator chamber to provide a constant and even flow of water over the entire surface. As paint is sprayed against the curtain, it is immediately carried downward to the sludge tank.

The Newcomb-David Centrifugal Wet Cleaning Spray Booth is available in a number of sizes to fit individual requirements.

Denso-Tech Rust Inhibitors

Denso-Tech, a synthetic formulation of specially selected synthetic materials which produce a remarkably clear rapid drying coating, has been placed on the market by Densol Paint Company, Box 34, South Park, Ohio. Denso-Tech produces a thin, uniform, exceedingly tough, flexible, transparent coating, the characteristics of which make it exceptional for many uses. The unusual rust preventiveness per unit thickness of Denso-Tech is said to permit a maximum of coverage per gallon.

The elasticity of the Denso-Tech film is such that it will stand bending, twisting or drawing without fracturing or affecting the adhesion. It is positive electrolytically and is rated high as to dielectric resistance.

Denso-Tech can be brushed, sprayed

CHROMIUM PLATING
SCREWS — RIVETS — WASHERS — NUTS —
EYELETS — SMALL STAMPINGS — TURNINGS
— WIRE GOODS
ROLLED AND POLISHED FINISHES
Send Samples for Estimates
THE CHROMIUM PROCESS CO.
CENTER ST., DERBY, CONN.

or dipped. It air dries at ordinary temperatures in 10 to 15 minutes. Denso-Tech can be baked to meet a wide variety of schedules, namely from one hour at 150 deg. F. to 10 minutes at 350 degrees F.

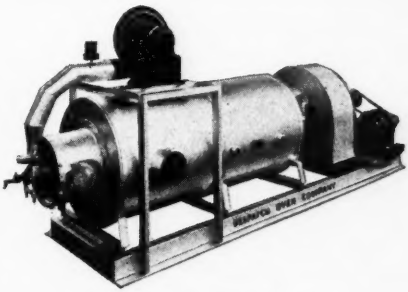
In addition to its use as a clean protective coating for unpainted or bare metal surfaces Denso-Tech is said to make an ideal rust preventive priming coat for use under practically any type of finish. Where used under oil or synthetic finishes, one-half hour air dry is ample. For use under lacquers, a bake of one-half hour at 225 deg. F. to 275 deg. F. is recommended or 36 hours air dry if baking is not feasible.

Where a fine one coat aluminum finish is desired 8 ounces of fine lining aluminum powder or paste to a gallon of Denso-Tech is said to produce a smooth, foil-like appearing finish having rust inhibitiveness and adhesion. Reductions of Denso-Tech and the quantity of aluminum powder or paste are said to produce exceptionally thin and very rapid drying aluminum coatings where finishes of this type are desired.

Despatch Oil Fired Heater

Despatch Oven Company, 622 Ninth St., S. E., Minneapolis, Minn., has recently placed on the market a new Oil Fired Heater. This Despatch Oil Fired Heater is of the convected air, recirculating type and is said to enable operators of ovens and dryers to modernize their equipment at a minimum of cost.

The Despatch Oil Fired Heater is externally mounted and is well adapted to practically all types of ovens. The unit is entirely self-contained and is of



Despatch Oil Fired Heater

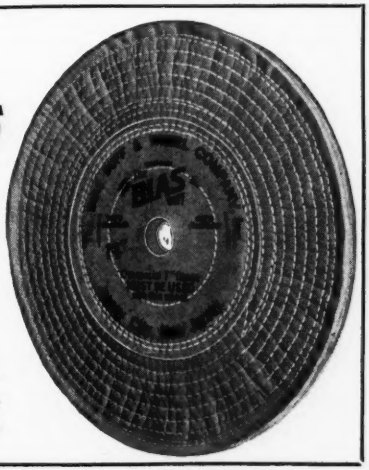
simple design and may be easily and correctly operated.

The New Despatch Oil Fired Heater is said to be ideally suited to various finish baking and drying ovens and for practically an unlimited number of heat applications.

The Despatch Direct Oil Fired Heater design is simple and practical. The construction is rugged. The body has heavy double steel walls, amply re-enforced and heavily insulated. The entire unit is self-contained, requiring no high pressure factory air for operation. A suitable high pressure blower and motor are provided with the heater so that operation

For "cutting down" and other severe operations

-this SEWED BUFF



This spirally sewed buff will stand up satisfactorily whenever used on hard rough work. Cuts fast and effectively under light even pressure, making it easy for the operator. The cloth in this sewed buff is cut and formed so that it positively will not ravel at any point on the circumference — a guarantee of no waste of material or polishing compound.

Try this BUFF on one of your HARD jobs.

Bias Buff & Wheel Co., Inc.

430 Communipaw Avenue

JERSEY CITY NEW JERSEY

Canadian Agents, Lea Products Co., 686 Notre Dame St., West, Montreal, Quebec, Canada.

after factory hours may be carried on with a minimum of expense.

The burner used in the new Despatch Direct Oil Fired Heater is a reverse blast unit, selected for its high operating efficiency, its ruggedness and its durability. The flame is said to burn clean without soot or carbon deposits because the oil is properly atomized and the oil and air are premixed in correct proportions before entering the scientifically designed combustion chamber. The combustion chamber is completely lined with a high grade refractory material.

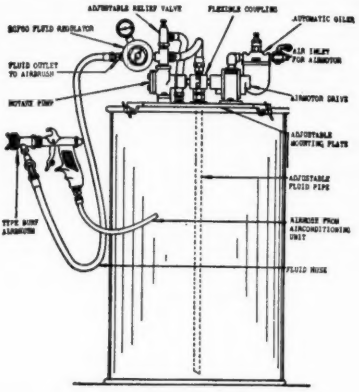
All products of combustion enter the working chamber of the oven or furnace, thereby obtaining full efficiency of the oil consumed. Fresh air taken into the heater, as well as recirculated air is controlled by an adjustable damper system to meet operating conditions. Varying the amounts of recirculated air or fresh air in no way affects the operation of the heater.

The Despatch Direct Oil Fired Heater is made in all capacities from 250,000 B.T.U.'s per unit to 2,000,000 B.T.U.'s per unit.

Paasche Fluid Pump Units

Paasche Airbrush Co., 1910 Diversey Parkway, Chicago, Ill., is marketing Fluid Pump Units, known as the "Types F825" and "F826". The Paasche Types F825 and F826 Fluid Pump Units are fully portable and can be mounted directly to material drums. Each complete unit weighs only 35 pounds.

The unit consists of motor, either air or electric driven, fluid pump with collapsible fluid tube, adjustable relief valve, regulator and gauge, and adjustable mounting plate. The unit is easily



Paasche Fluid Pump Unit

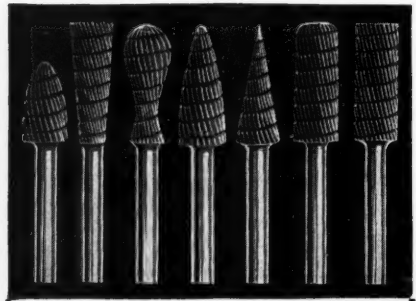
interchangeable and quickly transferable from one material container to another.

Paasche Fluid Pump Units are said to be ideal for use with non-abrasive materials. The paint supply to the airbrush is drawn directly from the original container or drum. Pressure, which is controlled by the fluid regulator, is built up by the pump to the airbrush and not in the container. From 1 to 60 lbs. pressure can be maintained continuously by this method.

Hexcel Universal Units

The Hexcel Radiator Company, Racine, Wis., announces the Hexcel Universal Unit for all-year use—heating in winter, and cooling in summer. Low pressure steam or hot water is used for heating, and cold water for cooling. Two sizes and two types of the unit are available; a pedestal type which stands on the floor and a suspension type which is hung from the ceiling.

One of the outstanding features of the Hexcel Universal Unit is the directional rotating louver, which can be set at any angle, thus directing the hot or cold air to the exact location desired.



HAMILTON
MILL CUT ROTARY FILES

Eighteen standard shapes and sizes made up in five different cuts. Adaptable for all classes of work and for all kinds of materials. Try them on your next job.

We maintain a complete service for making special files. Write for circular and price list.

THE HAMILTON TOOL CO.
HAMILTON • OHIO

This feature of construction is said to be very important because it prevents annoying air drafts from striking a person who is near the units. The use of a rotating louver is made possible by the round design of these units. Another Hexcel feature is the two-speed motor which, by the flick of the switch, gives either high or medium air delivery.

Hexcel Universal Units

An all-copper core, which has heavy seamless copper tubes and pure copper fins tightly banded together for high efficiency, is used for the heat transfer surface. The tubes are brazed in heavy gauge brass header plates and the tanks are drawn out of sheet brass. Standard pipe size seamless brass tubes, brazed into the tanks, are used for inlet and outlet connections.

The Model "A" Unit has a 12-in. fan giving a maximum air delivery of 334 cu. ft. per minute. Heat output is 32,600 B.T.U. per hour. For cooling, with ingoing water at 55 deg. and ingoing air at 95 deg., the temperature of 334 cu. ft. of air will be reduced to 71 deg. per minute. The Model "AA" Unit has a 16-in. fan giving a maximum air delivery of 610 cu. ft. per minute. Heat output is 54,200 B.T.U. per hour. For cooling, with ingoing water at 55 deg. and ingoing air at 95 deg., the temperature of 610 cu. ft. of air will be reduced to 71 deg. per minute. The Hexcel Radiator Company will supply complete piping diagrams showing ease of installation for both heating and cooling, and for cooling only. The units are beautifully finished with a brown crackle lacquer body and heavy ornamental bead of lustrous chromium. The air-directing louver is ebony black.

SEVERANCE MIDGET MILLING CUTTERS
Large stock of Standard cutters. Any shape, any size—custom made for burring, countersinking, taper-reaming, tube burring and facing, ball socket reaming, trepanning, etc. Submit your problem to our engineers. CATALOGUE ON REQUEST.

Severance Tool Mfg. Co.
1518 E. Genesee Ave., Saginaw, Michigan

Whether it's a heavy-duty job, or delicate jewelry finishing...

KALYE
SAVES time
SAVES material

Recommended by 50 years of brilliant service on the most varied and exacting cleaning jobs.

Not the cheapest . . .
but *cheapest in the long run!*

Ask for FREE copy PF of Kalye Manual.

RUMFORD CHEMICAL WORKS
RUMFORD, RHODE ISLAND

Milburn M-Lock Paint Container and Cover

The Alexander Milburn Company, 1436 W. Baltimore St., Baltimore, Md., has recently placed on the market a quart aluminum paint container and cover for attaching to siphon feed spray guns. The Milburn unit is said to be a positive and simple means of attaching siphon feed containers to spray guns.

The M-Lock container cover is a lightweight aluminum stamping which locks

Milburn M-Lock Paint Container and Cover for Siphon Feed Paint Spray Guns

in any position on the circumference of the aluminum container. The lip of the lock has a flange which fits over the rim of the container and seals against leakage with a fluid-resisting gasket.

The quart aluminum container has straight sides and is reinforced by a steel band around the lip, the aluminum being spun over it. There are no obstructions such as rivets on the inside.

The M-Lock cover will fit the standard quart paint can and is said to permit the use of paint cans which are usually discarded, thus enabling the spray gun operator to quickly make changes in color without the necessity of cleaning the container.

Denso-Metleaf

A metallic lead coating, to be known as "Denso-Metleaf", has been placed on the market by The Densol Paint Co., Independence, Ohio. Denso-Metleaf is a pure metallic lead finely leafed and reduced to a paste and mixed with a Densol vehicle.

Denso-Metleaf is resistant to sulphur dioxide gases and solutions, sulphuric acid solutions up to 25 per cent concentration, hydrogen sulphide gases, alkali, copper sulphate, zinc sulphate, iron sulphate and various brine solutions, lubricating oils, greases, and so on.

Denso-Metleaf will adhere to galvanized iron without preparing the surface with an acid treatment or weathering. It is said to work easily with a brush or in a spray gun, and dries quickly to a smooth sheet of metallic lead which is very malleable, resistant to shock and will not flake or blister under wide ranges of temperature.

As a metal primer, Denso-Metleaf affords outstanding resistance to corrosion.

Denso-Metleaf paints are said to provide protection for metal surfaces against the action of salt spray, and also surfaces subjected to gases encountered in pickling rooms, and cyanide solutions. Denso-Metleaf paint can be used for metal switch boxes, telephone boxes, and ventilating fan blades which are located underground and are subjected to moisture saturated air. For machinery and equipment, Denso-Metleaf paints are said to be most practical as a finish coat due to their resistance to lubrication oils and greases and their malleability and resistance to shock which eliminates chipping and flaking of the surface.

Acme Special Automatic Polishing Machines

A line of Special Automatic Polishing Machines for polishing glass channels of automobiles has been placed on the market by Acme Manufacturing Company, 1641 Howard St., Detroit, Michigan. The glass channel is fed between two rollers which carry the channel through, and aid in maintaining a constant point of wheel contact. As the

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Grinding Wheel and Abrasive Division of Simonds Saw and Steel Co.
Strictly first-quality aluminum oxide abrasive polishing grain manufactured in our own electric furnace plant under highest standards of quality and uniformity. Write for samples.
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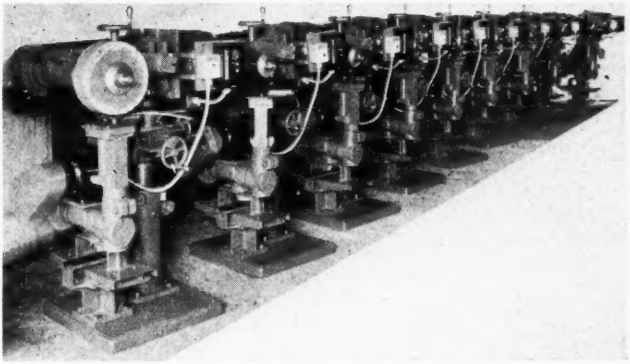
TACONY and FRALEY STS., PHILADELPHIA, PA.

channel passes under the wheel, the feed unit slowly strokes to avoid wear on the polishing wheel at any given point. The polishing wheel spindle is adjustable and floats at a tension on the work. This type of machine is said to have greatly reduced the finishing cost on this type of work.



Acme Special Automatic Polishing Machines

Plastic Rock Flooring

Plastic Rock Flooring is a material for leveling, surfacing and patching floors of concrete and wood which has been recently placed on the market by United Laboratories, Inc., Euclid at Ivanhoe, Cleveland, Ohio. Plastic Rock Flooring is supplied only in the form of complete units. Each unit is composed of the proper proportion of aggregate, setting powder, bond and asphaltic paste. The constituents of each unit can be mixed on the job merely by adding water. The flooring material can be spread and troweled in the same manner as concrete.

Plastic Rock units are supplied in three grades of aggregate—fine, medium and coarse. The fine is applied not over ⅛ in. deep; the medium is applied not over ¼ in. deep; and the coarse is applied not over ½ in. deep. Plastic Rock Flooring can be used for surfacing concrete and wood floors. It can be used for surfacing sidewalks, stair treads, ramps, reservoirs, plating room floors and so on.

Plastic Rock Flooring forms a tough, rubbery surface that is said to be practically impervious to cracking, curling, or crumbling. It is also said to be smooth, sanitary and easy to keep clean. It can be troweled to a feather edge as thin as paper and is said to be as fully efficient under loads of ten tons on steel wheels as for light pedestrian traffic. Its natural color is dark gray.

TAG Throttling Controller for Electric Furnaces

An economical means for obtaining throttling control of electric furnaces and ovens are now available in a new Celectray Indicating Photoelectric Controller which has been placed on the market by C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y. With this instrument no other equipment is required than is ordinarily used for on-and-off control. This is an indicating potentiometric controller with photoelectric detection of the position of a light-beam reflected from a mirror gal-

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CHARLES COOPER & COMPANY
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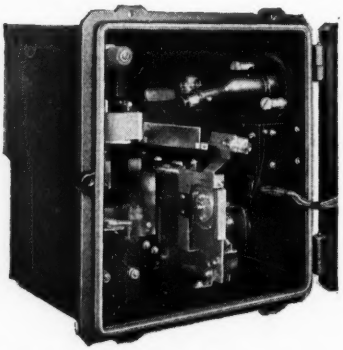
Works: Newark, N. J. Established 1857.

vanometer toward a reciprocating "controlling edge". With this automatic controller the heat supply is made to vary inversely as the temperature. The instrument has no measurable dead zone



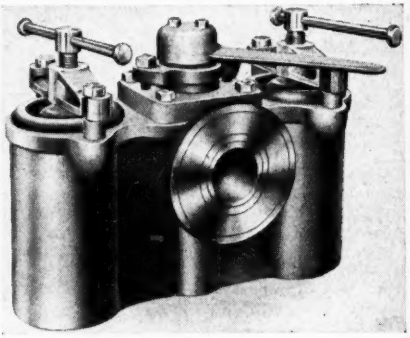
TAG Throttling Controller for Electric Furnaces

and holds a steady temperature instead of the oscillating temperature of on-and-off control. Life of the furnace switch or magnetic contactor is maintained by selecting the frequency of cycles according to the power requirements. The throttling zone can be readily adjusted within wide limits and the "load error" commonly met in throttling controllers can be kept within a few degrees without introducing appreciable hunting. In many cases a precision instrument is required to detect any variation in temperature. Adjustment for load error is provided.

A safety feature of this photoelectric controller is that when the lamp is burned out power is shut off. The instrument is particularly resistant to vibration, shock-proof mountings, however, being available. The circular scale and slide wire are 15 in. long and temperatures can be read within the accuracy of 0.1 per cent of the range. The scale appears through a glass window and temperatures are indicated by a brilliant white, red or green line of light on ground glass. This indication is visible at a great distance.

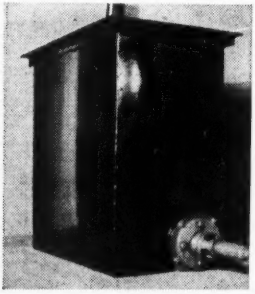
Duoflo Fuel Oil Strainers

An oil strainer which operates by a suction principle and can be applied to industrial oil burning furnaces, oil processing lines, and many other places



Duoflo Fuel Oil Strainers

where oil is used as a fuel, to be known as "Duoflo", has been placed on the market by Sheffler-Gross Company, Inc., S. E. Corner 5th and Chestnut St., Philadelphia, Pennsylvania. The Duoflo Suction Oil Strainer is made of semi-steel and has two perforated baskets held in place by the covers. This duplex construction permits one strainer to be



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SIMPLE OPERATION—SAVE ½ YOUR GAS BILL—ELIMINATE COSTLY STEAM BOILER OPERATION DURING SUMMER MONTHS—COMPLETE TANKS FURNISHED.

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cleaned while the other is in operation. The strainer baskets are large and have a straining area much greater than that of the oil intake pipe.

Cleaning of the strainers is easily accomplished without interfering with the operation of the system. It is only necessary to turn a plug cock, deflecting the oil through the other strainer, and removing the basket to be cleaned. Duoflo Suction Strainers are available in five sizes—1½ in., 2 in., 2½ in., 3 in., and 4 in., to meet the individual requirements of the system in which they are installed. All suction strainers are flanged and built to American standard specifications. Each assembly is hydrostatically tested to 150 lbs. per square inch before shipment.

Protex

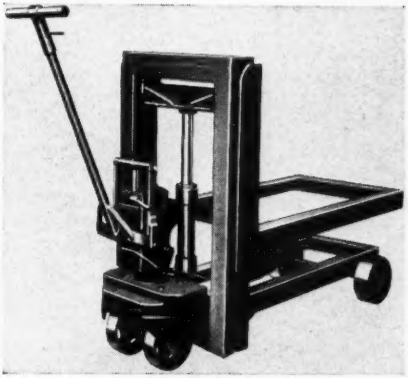
For protecting highly polished, painted, plated or duco-finished surfaces from scratches, dulling or tarnishing during storage, handling, fabrication and transit, the Haydn F. White Company, 1740 E. 12th St., Cleveland, Ohio, has placed on the market a liquid, to be known as "Protex". This liquid can be brushed or sprayed on the surface and then covered preferably with kraft paper. Protex quickly sets to a moisture-proof, coherent, tough skin which is opaque to light and is a good insulator of low-voltage electric current.

The Protex film readily peels with the kraft paper, or may be easily removed if the kraft paper method is not applicable. When the film is removed the original polished finish is revealed. Rust and corrosion is said to be prevented when parts or assemblies in storage are sprayed or brushed with Protex. Protex is available in acid and alkali resisting forms and may be supplied to fit individual cases. Protex covered sheets can be stamped or pierced without removing the coating.

Lyon Cantilever-Type Hydraulic Lift Truck with 10-In. Elevation

The lift truck shown in the illustration, an adaptation of the standard Lyon Hydraulic Lift Truck made by Lyon Iron Works, Greene, N. Y., was designed for a special handling problem where 10-in. elevation was necessary instead of the usual standard 3-in. elevation. The 10-in. elevation is obtained with the cantilever-type elevating frame.

The hydraulic elevating feature provides exceptionally easy lift, easy control and easy handling. The truck shown is rated at 3500 lbs. capacity. The lowered height is 9 in. and the elevated height is 19 in. The carrying platform is 24 in. wide by 42 in. long. The illustration shows the truck elevated to the full height of 19 inches.



Lyon Cantilever-Type Hydraulic Lift Truck with 10-In. Elevation

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

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If your dealer does not carry Magic Tack Rags, write us for sample.

Long Undershoes For Use In Plating Rooms

A new undershoe which is said to provide a worker with a resilient cushion that absorbs shock on hard floors, and prevents slipping on wet or greasy floors has been placed on the market by W. H. Long Company, 101 W. Austin Ave., Chicago, Illinois. The Long Undershoe is made of rubber fabric similar to that in an automobile tire. The fabric is assembled as indicated in the illustration and is equipped with a pair of straps. There are three sizes available to fit men's shoes from No. 6½ to 12. There is also one size available which fits women's shoes from No. 5½ to 7½.

Long Undershoes for Use in Plating Room

Trane Projection Heater

The Trane Company, LaCrosse, Wisconsin, has added a revolutionary projection heater to their regular unit heater line. The new heater is said to be a light weight, compact, high velocity unit of the propeller type. It is said to be a development of a novel means of conveying the natural reservoir of warm upper air in a building to the floor. The Projection Heater provides velocities equal to those obtainable with blower types. The heater both diffuses the air stream and carries it a considerable distance at the same time.

Structurally, the Projection Heater is very simple, consisting essentially of a two-row circular coil mounted between two circular plates. The circular construction of the coils takes care of normal construction and expansion. The upper plate is the supporting backbone of the unit. The lower portion provides the orifice through which the fan discharges.

The motor is mounted out of the direct path of the air on a three-point resilient construction which prevents motor noises from being telegraphed to the metal parts of the unit.

The Projection Heater is primarily designed for ceiling mountings where its inherent operating characteristics function best. The warm upper air is drawn through the coils and then projected straight downward to the floor by means of a four-blade propeller fan. The initial high velocity air stream induces a large amount of air in its downward course and reaches the floor zone at a negligible velocity with a tendency to spread and blanket the floor.

Spraco Automatic Finishing Machine

As many as three finishing operations and complete drying can be done automatically and continuously by this type of automatic finishing machine, recently developed by the Spray Engineering Company, 151 Central St., Somerville, Massachusetts.

Designed specifically for small machine parts, shell work, novelties, and similar items, this machine is unusually compact and fast in operation, and accom-

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SMOOTHER SPRAY
—and smoother work, smoother production with the Milburn paint spray gun. Wide, wet spray — easily adjusted.
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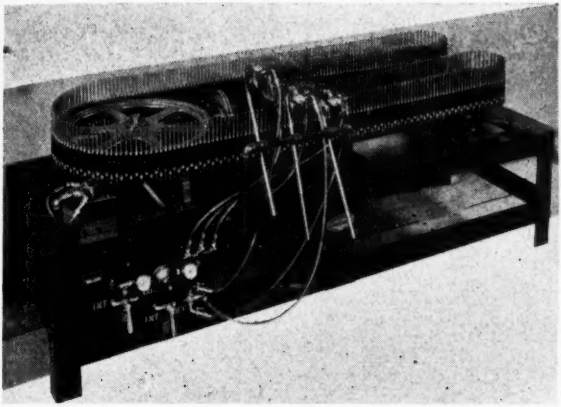

Spraco Automatic Finishing Machine

modates a wide variety of products. Finished items can be packed immediately on removal from the machine.

Several hundred vertical spindles are rotated as they pass through the sprays from the guns, which can be adjusted independently to provide complete coverage. Speed of operation can be adjusted to provide proper drying time.

In operation, the complete unit is enclosed by an exhaust hood and drying chamber. Spraco Automatic Finishing Machines are furnished in many different types, sizes, and operating characteristics for special needs. Complete information may be had from the manufacturers.

Electronic Bathytrol Instrument For Determining Paint and Lacquer Film Thickness

An instrument for accurately measuring the thickness of paint and lacquer film, to be known as "Bathytrol", has been placed on the market by the Electronic Control Corp., 2832 E. Grand Blvd., Detroit, Michigan. The film thickness is determined by penetration. The control of the depth of the stylus, penetrating the insulated paint film, is controlled by either a standard micrometer depth gage, resting on an insulated foot, or a dial indicator where more rapid measurements are required, but in order to eliminate the possibilities of false readings, the stylus itself is connected to a grid circuit of a simple triode tube. The bare metal beneath the paint film is maintained at a positive potential so that when the smallest metallic contact between the stylus and the bare metal is obtained, a few millivolts positive with only a few micro-amperes of current shift the grid of the tube to a positive position so that the tube's plate circuit passes sufficient current to energize the telephone type relay.

This telephone type relay requires but a few mill-amperes which is still considerably less than the normal current passed through an ordinary depth gage stylus. The relays close as soon as the metal stylus of the Bathytrol makes an infinitesimal contact of the base metal beneath the paint. These contacts control an indicating pilot lamp which announces to the operator immediately the "end point", or at exactly the time that the smallest section of the spherical point of the stylus comes

If you have a finishing problem of unusual difficulty

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The Varnish Products Co.

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in contact with the bare metal beneath the paint.

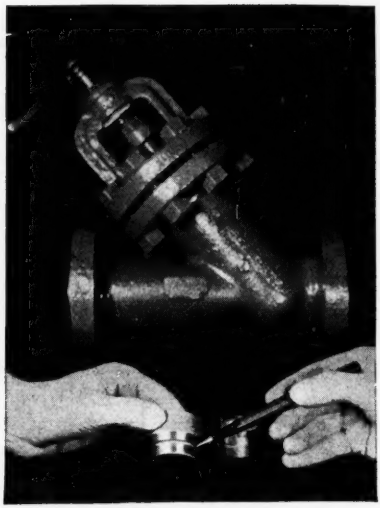
Repeated tests on various types of metallic bases, ferrous and non-ferrous, in comparison with all other gages, are said to have proved the reliability and accuracy of the Bathytrol for taking the guess-work out of measuring the thickness of paint films.

Hancock Blow-Off Valve

The Hancock Valve Division, Manning, Maxwell and Moore, Inc., Bridgeport, Conn., has placed on the market a full line of boiler blow-off valves. This line of Hancock valves incorporates a number of features including a distinctive "Blo-Deflector" protecting lip. The manufacturer states that this design principle deflects boiler blow so effectively that these valves are almost indestructible.

To further increase the wear resistance of these valves, stainless steel valve discs hardened to 500 Brinell and renewable valve seat rings heavily stellited are provided. Due to its construction, the manufacturer states that maintenance cost is reduced to a minimum.

The illustration shows the unique "Blo-Deflector" protection lip on the



Hancock Blow-Off Valve

500 Brinell stainless steel valve disc. The Blow-Off Valve is available in both straightway and angle types for boiler and economizer pressures up to 1660 lbs. in full compliance with A. S. M. E. code requirements.

Multimaze Air Filter

Among the various types of air filters available today is one that might well be called an "all purpose" unit. It is the Multimaze Air Filter manufactured by the Air-Maze Corporation, 812 Huron Rd., Cleveland, Ohio.

The Multimaze is a compact, cleanable, metal-fabricated air filter of patented construction. It is obtainable in various sizes for internal combustion engines, air compressors, blowers and air conditioning systems. Air cleaning efficiency is claimed by the manufacturer to be better than 99 per cent; restriction less than ⅛ in. H_2O. A Multimaze installation requires a negligible amount of space even when the application demands thousands of c.f.m per minute. Servicing is simple.

For certain types of air conditioning installations the Multimaze units are more suitable than panel filters. As an instance: two No. 22-M hooded Multimaze filters efficiently handle an air filtration task that would require eight

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Genuinely Friendly
In CLEVELAND it's
√ The HOLLENDEN
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In TOLEDO it's
√ The NEW SECOR
In JAMESTOWN, N. Y., it's
√ The Jamestown and
√ The SAMUELS

20x20x4 in. panel filters with frames and weather louvres. The circular units take minimum of space, can be protected against the weather, and are easy to maintain.

The Multimaze filter element media may be especially constructed so that air cleaning problems where lint or other disturbing factors are present may be easily circumvented.

Towns Galva-Kote

A metallic zinc in a weather resisting vehicle to be known as "Galva-Kote", is now being marketed by Towns Paint Co., Inc., 213 E. Genesee St., Buffalo, New York. The characteristics of this paint qualify it for use both as a primer and as a finishing coat. The paint will adhere firmly to new galvanized metal and is said to be suitable for all types of metal construction having outdoor exposure. Its content of finely divided metallic zinc in a weather resistant vehicle affords a finished appearance and is said to resist atmospheric attack so no covering coat is required.

One coat of Galva-Kote will cover and adhere to any metallic surface that is clean and dry. Covering capacity is from 700 to 900 ft. per gallon. The final appearance is battleship gray.

Opportunity Section

THIS Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:

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POSITION WANTED — Chemist plater, 23 years old, Yale 1935 S.S.S. Chemist with 2 years plating experience including actual plating, building up, analysis and control of electrolytic cleaners and plating solutions such as acid copper, cyanide copper, alkali zinc, cyanide cadmium, nickel, bright nickel, die-cast nickel, chromium, silver, gold (Bek Process), etc. Has also experience in the modern methods for the quantitative analysis of water, lubricating oils, electrodeposits, iron, steel, alloy steels, brasses, bronzes, german silver, etc. Desires position as an analytical chemist. Excellent references.

Address replies to Analytical Chemist, care of PRODUCTS FINISHING, 431 Main St., Cincinnati, Ohio.

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